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GAS JOURNAL

LIGHT ✦ HEAT ✦ POWER ✦ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

VOL. CLXXII. No. 3267.] LONDON, DECEMBER 23, 1925. [77TH YEAR. PRICE 1s.

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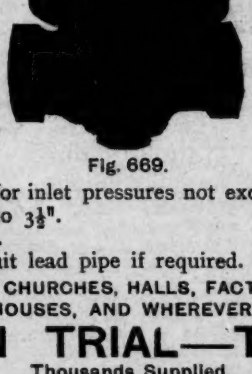

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PROPRIETORS: WALTER KING, LIMITED. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

Telephone: Central 6055. —— Telegrams: "GASKING, FLEET, LONDON."

VOL. CLXXII., No. 3267.] WEDNESDAY, DECEMBER 23, 1925. [77TH YEAR.

. . . . A . . . .

Merry Christmas

. . . To All . . .

EDITORIAL NOTES.

The Case of Horley.

FRESH light has been thrown upon this matter through proceedings in Parliament last week; and, though the situation remains much as it was, we should imagine that the disclosures in the matter of Horley will lead Parliament to review their position in relation to Departmental procedure. The question which has emerged from the proceedings on the Horley Gas Company (Electricity Powers) Bill and on the Electricity Company's Special Order is as to whether Parliament is actually to be the superior authority in the granting of new powers or the Electricity Commissioners, whose doings appear to be simply adopted and ratified as a matter of course by the Ministry of Transport. After a week's interval from the discussion in the House of Lords, as reported and commented upon in our last issue, their Lordships had the matter before them again; and then it was decided to ask the Special Orders Committee to report whether a further Parliamentary inquiry was desirable. The Special Orders Committee considered the matter on Thursday; and the position was placed before them completely on behalf of the Horley Gas Company by Mr. E. Campbell Cooper, of the well-known firm of Parliamentary Agents; while Mr. W. Sedgwick (of Messrs. Rees & Freres) addressed them in defence of the Electricity Company's position. But there is one thing that is especially noticeable between the two submissions to the Committee, and it is that Mr. Sedgwick did not attempt to upset in any way the very destructive criticism that Mr. Cooper levelled against the procedure which had placed the Gas Company in the position of which they very justly complain, as described last week. It is that position, and how it came about, which should have (in addition to the relative merits of the two schemes) the very critical consideration of Parliament. We will not enter here into the points raised, but refer readers to the illuminating exposition by Mr. Cooper of what has actually occurred. There is the lightning speed with which the Electricity Commissioners hurried the Electricity Company's Order through; there is the eleventh-hour alteration from local generation to bulk supply in the Order; there is the promise of the County of London Company to pay a goodly sum towards the expenses of the Electricity Company if they take a bulk supply from them; there is the statement by Mr. Cooper (whether the inference is that this had any effect we do not know) that an ex-Electricity Commissioner has recently become the Manager of the County of London Company; there is the suggestion that the report by the Ministry of Transport may have influenced the House of Commons Committee to reject the Gas Company's Bill, after a Committee of the House of Lords had made exhaustive inquiry, and had passed it—the Electricity Order being granted by the Commissioners before the Commons Committee rejected the Bill. However, in view of the exhaustive inquiry by the House of Lords Committee, Mr. Cooper could not see that another inquiry was necessary; and, to say the least, it would be very hard on promoters like the Horley Gas Company to have to face the expense of a double inquiry, because of procedure which they consider to have been unfair to them as petitioners to Parliament for new powers. Whatever the Special Orders Committee may have thought of the proceedings of which Mr. Cooper and his clients complain, they simply reported to the House of Lords that they did "not recommend that a further Parliamentary inquiry should take place."

Liquid Purification.

THE interest in technical matters relating to the treatment of gas after it has left the retort-house continues. This was reawakened by Dr. T. Lewis Bailey in the paper read before the Institution of Chemical Engineers in July, and has been mentioned in other communications from the same source, and from Dr. E. W. Smith and Mr. T. C. Finlayson recently in Newcastle. The latest contribution comes from actual gas-works practice, in a well-equipped works and under the supervision of one of the most able gas engineers in the country. Mr. T. R. Cooke, Assistant to Mr. John Bond, Engineer and Manager of the Southport Corporation Gas-Works, lately placed before the Manchester and District Junior Gas Association [*ante*, p. 432] the detailed results of the most interesting large-scale experimental work in connection with gas purification that has been carried out in recent years in England. The work is obviously incomplete. The problem with which the management at Southport was faced was the frequently occurring one in rapidly progressing undertakings—shortage of purifying area. The position has been very distinctly relieved by the adoption, even if only in an experimental way, of the original American Koppers' processes of liquid purification, the English rights for which (readers may be reminded) are held by the Woodall-Duckham Companies. The process at Southport has only been called upon to extract a small proportion of the H_2S. The direct costs of purification have not been reduced, but capital expenditure has been saved; and it is anticipated that the elimination of cyanogen, and the reduction in the amount of air that is necessary for revivification purposes in oxide purifiers, have given an indirect advantage which should prove, over an extended period, much greater than the whole cost of purification.

A difficulty originally experienced with the American Koppers' sodium carbonate process was in connection with the handling of the actifier air, which contained the H_2S. The Chief Inspector of Alkalis will not allow H_2S to be eliminated from air which enters the atmosphere by means of a heap of oxide, unless there is absolute certainty of the complete extraction of the H_2S content, nor will he allow the air to be used under boilers, or in producers, or in any other way in which the combustion products containing the resultant SO_2 will pass to the atmosphere. Under the very partial purification conditions existing at Southport, it is practicable to use a heap of oxide, and to give it the necessary attention; but under more stringent conditions where the practically complete elimination of H_2S from the gas is necessary, the volume of air will

be so great that special provision will have to be made for oxide containers, and many of the difficulties and inconveniences of ordinary oxide purification will be met, although it is obvious that the oxide purification of air impregnated with H_2S is likely to be simpler than oxide purification of gas impregnated with H_2S.

For these reasons, it appears the American Koppers Company have developed a somewhat modified process, in which the sulphur is recovered as sulphur; and there would appear to be no chance of any H_2S escaping to the atmosphere. The new process is being worked on plants as large as 24 million c.ft. per day capacity in the States; and the British Licencees are watching the results with great interest. We understand that there is a possibility that the new process will first be tried-out at Southport, immediately the American results justify this course.

If a process has been, or can be, developed which will eliminate H_2S and cyanogen, reduce sulphur compounds, obviate the necessity for using air for revivification, and assure less back-pressure to the gas stream, while at the same time occupying much reduced ground space, and costing less in capital expenditure than ordinary oxide purification, a great advance will have been made in the technique of gas treatment. The Southport authorities are to be congratulated on their enterprise in this connection.

Local Authorities as Coke Retailers.

OUR Labour-Socialist friends in the House of Commons are anxious that local authorities shall extend their functions to the retailing of coke—apparently by hawking it round from door to door. There is a curious inconsistency in the desires of this section of our political representatives. A little while ago there was a feverish desire on their part that electricity supply should be developed to such an extent that every artizan's or unskilled labourer's household would be able to cook by electricity, have such satisfaction as may be derived from sitting round an electric radiator, and obtain relief from domestic labour by means of electrically operated mechanical contrivances. Probably they would also like to see in time industrial labour done away with by electrical operation, which would produce so much wealth that the dole could be largely increased, and everybody have sufficient on which to live without work. Of course, those who thought electricity was going to bring about a new domestic life were the dupes of fiction, imagination, and misrepresentation. But they have come down to earth again. And, lately, Mr. John Beckett (Gateshead) has been asking the House to grant leave to bring in a Bill to extend the powers of local authorities in order to authorize them to retail coke. Mr. Beckett represents a constituency in which electricity is supplied at about the cheapest rates to be found in the country; and this by a combination of generating stations which, it may be surmised, partakes of the nature of the scheme which the Government are likely to produce. Yet the working folk in the North-East area cannot afford to have "all-electric" houses. Therefore one of their Parliamentary representatives asks that local authorities shall become gas-coke retailers. This is interesting; we welcome the prodigals back to the fold.

Mr. Beckett, however, neglected the opportunity of supplying details as to the powers that he has in view for the local authorities in respect of coke. In most of the large industrial areas, the gas-works belong to the local authorities; and anybody can purchase coke from them. But we hardly think it is within their province to start a hawking business in this fuel—in fact, we imagine there would be, if they did, a great outcry against their "taking the bread out of the mouths" of the local traders in coke. But there is a feeling that the retailing of coke somehow breeds dishonesty. We were not aware that coke possesses any specially evil-producing qualities in this regard, unless it is that it can be somewhat bibulous, but only in respect of water. This capacity of coke may be known to some retailers, and, if coke is sold by weight, water is cheaper than carbon. But the watering of coke for this purpose is not a common experience. We are prepared to admit that there are both honest and dishonest coke retailers, and that the dishonesty is in the direction of short weight or measure. Those who practise this fraud deserve to be punished; but the fraud is not a general one—any more than mendacious scales are common among butchers, bakers, and greengrocers. Mr. Beckett has been reading the report of the London County Council Committee on the subject of coke retailing, and has taken deeply to heart the examples given of the victimizing of buyers of coke by the venal retailer. The view of the County Council is that general powers should be conferred upon local authorities to inspect and weigh deliveries, and to bring transgressors to book. Mr. Beckett apparently does not think this would be a sufficient deterrent against fraud by the retailers. He should investigate whether it has been so in those cities and towns where the local authorities have these powers, obtained through their own Special Acts. Whether or not the powers have been beneficial, Mr. Beckett thinks the system of detection by a number of expensive inspectors cannot be nearly so efficacious as the local authorities retailing coke at a price which would clear their expenses, and not leave the poor of their districts at the mercy of men who make them pay dearly, and give short weight or measure. Apart from the fact that we do not think local authorities would wish to begin retailing coke round the streets, it is doubtful whether they would be able to do this with the same efficiency as dealers who do not engage in nefarious practices.

However, though Mr. Beckett pleaded, with a hard winter facing us, that the House should do something to enable people in the industrial areas to get some kind of cheap and useful fuel, leave to bring in the Bill was refused. No doubt the view was that it would not improve matters; and the local authorities could not be compelled to render the suggested service. Left to their option, the position would remain much as now. With the strengthening of the law as proposed by the London County Council, dealers who are inclined to enrich themselves by illegitimate means would not be willing to run the risk of detection.

Cut Discussions.

THE councils of our technical institutions would do well to consider a matter of procedure in connection with discussions on papers. It is an ancient and yet surviving complaint that at meetings which are called for the very purpose of collecting from many sources views and experiences, discussions are sometimes squeezed into an uncomfortably tight corner, and thus no one can do justice either to the authors' contributions or to themselves. It is safe to say that much excellent material is sacrificed through this. One cause of this condition is the overloading of programmes; and another is the application of a time-limit for a paper and discussion, though no fixed limit can apply to all papers and discussions. Sometimes perhaps a time-limit is an advantage, when loquacity and futility are the predominant features of a discussion, and good time is being wasted. But when a subject is before a meeting which is of a controversial nature or upon which light from all points of view is desirable—especially from qualified people—it is regrettable when there is forcible repression. Some of the members of the Institution of Electrical Engineers are in this matter up in arms against their Council. They have long felt that the stringent time-limit which is applied to their evening meetings is tiresome and inimical to the best interests of the organization, and the objects it is intended to serve. The limit for the meeting is 8 o'clock; and there is such precision over this that a visitor would imagine that it was a matter of life or death that at the stroke of 8 nothing more should be said. One protesting spirit in the "Electrical Review" mentions a "Council dinner" after the meetings; and this may account for the restive state of affairs among the councillors as the hand of the clock approaches 8. But the President sees to it that the curtain is rung down to time.

Discontent seems to have reached its climax when 8 o'clock, and apparently the Council dinner, were regarded on Thursday, Dec. 3, as being much more important than the question of the "all-electric house," which is a topic of the liveliest interest among electrical men at the present time; and they hope it will become so among the public. The paper was by Dr. S. Parker

Smith, and it described the electrical equipment and experiences with it in a house he has erected at Glasgow. There were visitors present—some heating specialists—who had been invited by the Council to take part in the discussion; and courtesy alone should have allowed them time to deal with a matter bristling with points upon which they were distinctly qualified to speak. Prof. Arthur H. Barker, whose position in the heating world is second to none, was, with others, only allotted about three minutes to deal with matters in the paper to the study of which no doubt he had devoted as many hours. From our reading of the paper, we believe that it contains many claims which Prof. Barker would consider would be entirely misleading to the public in regard to the possibility and desirability of an all-electric house; and we should very much have liked to hear or read what we are sure would have been a reasoned criticism of the statements. On the occasion, the President allowed the reader of the paper to exceed his allotted time by half-an-hour, and he gave plenty of latitude to certain prominent members of the Institution to descant on the paper in a more or less ill-informed manner. And then the invited visitors were cut-off with a paltry three or four minutes. We might be pardoned for thinking, if the Council dinner was not the magnet, that the object of such curtailment was to stifle discussion, and prevent exposure of the absurdities of the claims made in the paper. When the discussion of a subject of public interest is contemplated, it is ridiculous, as well as misleading, to confine it to the usual adulatory matter, which is the stock-in-trade of half-informed and interested persons who desire to speak, but have no specific information to communicate. We sympathize with the invited visitors, to whom better courtesy should have been shown, and we hope the occasion will be the turning-point to reformation.

Atmospheric Pollution.

THE Meteorological Office of the Air Ministry has forwarded the eleventh report of the Advisory Committee on Atmospheric Pollution, dealing with their activities during the year ended March 25 last. The work which the Committee have done, and are doing, is highly valuable to the whole community; and there is good reason why there should be no cessation of it. At the time of the previous report, negotiations were pending to permit of the continuance of their operations; and these have not yet been concluded. It is gratifying to learn, however, that—scientific investigations into atmospheric pollution being now acknowledged to be of great value from the point of view of health, and in many other ways—a satisfactory organization will be evolved which will permit the work to be continued and extended in scope. Progress, however, appears to be rather slow in obtaining representation of the whole of the country, and bringing the atmospherical conditions in all parts under the scrutiny of the Committee. During the year, only three additional deposit gauges were installed; and there are only nineteen authorities at present co-operating in collecting data from forty-eight different stations. This shows that there are extensive areas in the country which are unrepresented. Nevertheless, the accumulated data are highly instructive in the enlightenment they convey.

Some of the information clearly upsets certain theories which we may have formed from simple consideration of conditions without definite corroborating research. For example, we might have been pardoned for thinking that deposits of impurities would have been consistently higher in winter than in summer, in view of that being the period of maximum combustion of coal for domestic heating. But the data reveal that at some stations the deposits are higher in summer than in winter; and the variation extends to the impurities themselves, and to different parts of the country. For example, out of 36 stations, the winter deposit of tar was greater in 15, while the summer deposit was greater in 20. The deposits were found equal in one London station. Out of 40 stations, the deposit of carbonaceous matter was greater in winter in 9 cases, and in summer in 31. Of 41 stations, the winter deposit of insoluble ash was greater in 11, and the summer in 30. Out of 41 stations, the winter deposit of soluble ash was greater in 21, the summer in 20. Out of 44 stations, the total deposit was higher in winter in 16, and in summer in 28. Out of 40 stations, the winter deposit of sulphates was higher in 29 instances, and the summer in 11; of chlorine, the winter deposit was higher in 35 stations, the summer only in 5; and of ammonia, the winter deposit was higher in 17, and the summer in 23. The rainfall may partially account for this, inasmuch as out of 44 stations, the winter rainfall was higher in 16 cases, while the summer was higher in 28. More is known now as to the effect of wind and other conditions on atmospheric impurity, and the trouble occasioned to humanity. Another noticeable observation is that in all of the stations there is a general tendency towards fewer thick smoke hazes on Saturdays and Sundays; and between Mondays and Fridays now there is no definite indication that haze is more frequent on one day than on another. We hope the good informative work of the Committee will long continue, and that the data will show, as time passes, that the gas industry is contributing to a progressive improvement in the purification of the atmosphere. It has already done much good work in this direction.

Parliament.

The prorogation of Parliament took place yesterday.

Gas Workers' Wages.

It will be remembered that at midsummer the wages of gas workers were stabilized until Dec. 31. The matter is again before the Joint Industrial Council for the Gas Industry, on the lines of the petition presented in July, 1924.

Small Investors.

Socialist representations as to "capitalists" being a class by themselves in the social edifice has been repeatedly disproved. It was not long ago that Mr. Runciman, in reply to Socialist statements as to the wealth of the "capitalist" class, published figures showing how the mass of capital holdings in the banks belongs to small investors. Mr. Lewis Edwards, Secretary of the Liverpool and District Economic League, in conjunction with the Central Council of Economic Leagues, has since obtained typical figures from various well-known companies. The majority show that the shareholders are mostly comparatively "small monied" men who have invested their savings. The average amount held by each is between £100 and £500. Higher averages are shown by the railway companies, which is accounted for by the fact that they are regarded by other companies as a suitable investment for their funds. In Mr. Edwards' list is the Liverpool Gas Company. It has a paid-up capital, &c., of £3,163,000, divided among 6254 holders, the average investment being £506. Some substantial gas companies can show a lower average than that.

Coal Wagon Pooling and Capacity.

Among the hundred-and-one topics which the Coal Commissioners have been invited to consider as bearing upon colliery economy is the capacity of wagons and the ownership. Some witnesses have advocated pooling of all privately-owned wagons, with complete ownership by the railway companies, as one way of effecting economies—one witness estimating these as ranging from £600,000 to £1,000,000 per annum. Another witness reckoned that the abolition of wagons of less than 20-ton capacity would result in economies amounting to not less than 20 p.ct. of the costs of operation, and it might be more. But, of course, such substitution could only take place as the smaller wagons became unfit for use. It was submitted by Mr. Evan Williams that the change to 20-ton wagons would cost £80,000,000, and interest and depreciation would represent £8,000,000 yearly, which would be equivalent to about 9d. to 1s. a ton on all the coal carried. A carefully reasoned argument against the advocates of pooling and 20-ton wagons has been submitted to the Coal Commission by Mr. F. W. Cooper, a member of the Committee of the Association of Private Owners of Railway Rolling Stock, and Mr. C. H. Taynton, the Secretary. Extracts from their statement are given in our "Miscellaneous News."

Railway Trouble Averted.

The Rt. Hon. J. H. Thomas has advised the railwaymen to accept the award of the National Wages Board as being the best that could be obtained in the present circumstances of the companies, and has urged them to work sympathetically and co-operatively with a view to improving the economic conditions of the industry. Following this came the threat of a strike of the railway shopmen on the Great Central and Cheshire lines. But, fortunately, this has been averted by the decision of the Ministry of Labour to set up a Court of Inquiry into the dispute. In view of this, the Executive of the "N.U.R." resolved to withdraw the strike instruction which was issued to the men.

Rating and Valuation.

The House of Lords gave third reading to the Rating and Valuation Bill last Thursday. Their Lordships, or some of them, were very displeased with the Commons for allowing them such meagre time for the discussion of this important measure. It is also noticed that there are pessimists among the Lords regarding the working of the scheme. The big reduction of the number of the rating authorities—in the case of rural ones from 1300 to 650—and the consolidation of rates have given the impression that, owing to the increasing burdens which are being put on local authorities, in future it will be difficult to get people to come forward to serve on them. That is the opinion of Earl Beauchamp; and Earl Russell does not think the best people will be secured to serve on the committees.

PERSONAL.

Councillor J. Ferguson Bell, M.Inst.C.E., has been appointed a Justice of the Peace for the County Borough of Derby. Mr. Bell has many and varied interests outside his professional duties in connection with the Derby Gas Light and Coke Company. He is Chairman of the Derby Corporation Water Committee, a member of the Derwent Valley Water Board, a keen member of the Derby Education Committee, Vice-Chairman of the Derby High School for Girls, and a Governor of King Edward's Grammar School for Boys.

The December issue of the Brighton and Hove General Gas Company's "Co-Partnership Magazine" contains a photographic illustration of handsome gifts presented to Mr. C. H. Rutter (the Engineer and General Manager), on behalf of the whole of the employees, by Mr. G. H. Mepham (the Chairman of the Social Committee). The occasion was the Company's Fourth Social, at the Hove Town Hall, the prizes gained at which were distributed by Mr. Rutter; and the gifts comprised a handsome coffee service in Limoges china (ornamented in silver gilt), a case of gilt spoons, and a silver cigarette box. The presentation was a mark of appreciation of the intense interest which Mr. Rutter takes in all matters affecting the happiness, welfare, and enjoyment of the employees.

We learn that Mr. G. M. Gill sailed for New York on the 19th inst. on business in connection with gas development in the United States, and will be away for five or six weeks. His address in New York will be Engineers' Club, 42nd Street, New York City.

Mr. W. J. Collins Garrard, of Ipswich, has been elected an Associate Member of the Institution of Civil Engineers. He is an assistant to Mr. Frank Prentice, Engineer and Manager to the Ipswich Gas Company.

Included in the latest list of members elected to the Society of Chemical Industry is Mr. Albert Whatmore, of Messrs. Parkinson & Cowan (Gas Meters), Ltd., Victory Works, Stretford, Manchester.

The many friends of Mr. and Mrs. H. M. Thornton will be interested to learn of the appointment of Mrs. Thornton's brother, Dr. Hazel, C.B.E., M.A., as Principal of Jesus College, Oxford.

FORTHCOMING ENGAGEMENTS.

Jan. 8.—Chemical Engineering Group.—Burlington House, Piccadilly. 8 p.m.
Jan. 12.—Institution of Gas Engineers.—Advisory Committee on Education.
Jan. 12.—National Gas Council.—Meeting.
Jan. 12.—Federation of Gas Employers.—Meeting.
Jan. 13.—Institution of Chemical Engineers.—Burlington House, Piccadilly. 8 p.m.
Jan. 13.—Institution of Gas Engineers.—Emergency Committee.

ELECTRICITY SUPPLY MEMORANDA.

There were great expectations by the members of the Institution of Electrical Engineers when it was announced that Prof. S. Parker Smith, D.Sc., would give them a paper on an all-electric house which he has built at Glasgow; but on the occasion of its reading, there appeared to be rather lukewarm enthusiasm over it. Those who heard realized there were several undesirable aspects regarding the cost and other data spread before them by the author. One we think was that there are not many cities or towns which could afford to do much domestic business on the terms that the Glasgow Corporation are doing this—an overall cost of 0·637d. per unit consumed, including lighting. If the whole of Glasgow's domestic electricity business was turned-over to the two-part system of charging, and the total income averaged 0·637d. per unit, we are afraid that the revenue account of the Department would not wear the gratifying aspect that it does now, nor would the incidence of demand be so gratifying to the Engineer and his Committee. The house is a ten-roomed one; and the heating consumption (apart from cooking and water heating) only averages 16 kw.h. per day per annum, or for six months in the year 32 kw.h. per day. It would have been better if Dr. Smith had averaged the room-heating consumption per day of actual use. Anyway, for a ten-roomed house of the cubical capacity of that of the author, reckoning 2 kw.h. per room per hour of use, the consumption discloses a frugality which would have no attraction for us in such weather as has lately been experienced. Again, for hot water supply for six persons, an expenditure of 20 kw.h. per day does not suggest any extravagance in the use of hot water. Of the total consumption of 16,584 kw.h. per annum, 7285 are for water heating, and of these 6043 are supplied at 0·375d. (these being used during the night between 11 p.m. and 7 a.m., with a hot water storage system). The capital expenditure on Dr. Smith's complete electrical equipment was buried out of sight; all he chose to say on the subject was that the total cost of the house was 3 or 4 p.ct. more than on a house equipped with ordinary coal and gas appliances. The following data will be of interest:

Dr. Parker Smith's Electric House.

Energy Costs for 52 Weeks (4 Quarters).
July 12, 1924—July, 11, 1925.
Six persons in house, excluding guests.

	£	s.	d.
Main 2-rate meter—fixed charge	12	10	0
Day load—10,299 kw.-h. at 0·5d.	21	9	2
Night load—6043 kw.-h. at 0·375d.	9	8	10
Total cost for year	£43	8	0

Average cost per week, 16s. 8d.
Average cost per day, 2s. 4¾d.
Average cost per day per person, 4¾d.
Average cost per kw.-h.—day consumption, 0·791d.
Average cost per kw.-h.—total consumption, 0·637d.

In the Glasgow Corporation Electricity Department's last financial year, the total outgoings on revenue account averaged 0·94d. per unit of accounted-for electricity—that sold and used on works—without taking into calculation anything for capital charges. The coal consumed for the accounted-for electricity averaged 2·12 lbs. per unit; and the cost was 18s. 9d. per ton. On this basis, the expenditure of coal alone to meet Dr. Smith's requirements amounted to about 16 tons. There are few places that can afford to be so lenient as Glasgow in the matter of price to even a comparatively few consumers in all-electric houses; where the charges are higher, one can easily calculate what would happen taking Dr. Smith's circumstances as the basis.

Analysis of Consumption in KW.H.

Separate Meters.	Total.	Weekly.	Average. Daily.	Per Day per Person.
Heating	5,954	114	16	2·74
Hot water	1,242 day / 6,043 night	140	20	3·33
Cooking	2,777	53	7·5	1·27
Lighting	568	11	1·5	0·26
Total	16,584	318	45	7·60

Analysis of Costs.

Separate Meters.	Total.	Weekly.	Average. Daily.	Per Day per Person.
	£ s. d.	s. d.	s. d.	d.
Heating	19 3 7½	7 4½	1 0½	2
Hot water	4 0 0 day / 9 8 10 night	5 2	0 9	1½
Cooking	8 18 11½	3 5	0 6	1
Lighting	1 16 7	0 8½	0 1	½
Total	£43 8 0	16 8	2 4½	4½

Sundry Other Points. We see that the tank for hot water storage is lagged with 2½ in. of cork. Regarding the cooker, Dr. Smith stated that the boiling plates are rated at 1½ and 2 kw. respectively, and are satisfactory, though better results still should be

obtainable. The efficiency of the open type boiling plate may be only 20 to 25 p.ct. when starting from cold—little better than a coal fire. Dr. Margaret Fishenden, in the discussion, commented on the discrepancy there was between these figures and advertised ones. The author is of opinion that it is a question whether it may not be better to substitute cooking utensils, each with its own heating element, fitted with watertight plugs. It is noticed that in his house Dr. Smith has three external chimney breasts for ventilation purposes, and fire place recesses have been retained. He can therefore easily adopt solid fuel should he feel so disposed. In the discussion, Prof. A. H. Barker pointed out that it was impossible with electricity to get more than 20 p.ct. of the heat of the original coal into a house, whereas a much higher percentage could be obtained by other means; and he indicated that the gas undertakings are doing considerably better than this. Major E. O. Henrici pointed out that in the district in which he resides his costs for electric operation on the lines of Dr. Smith's would amount to about £100 a year. By using coal, gas, and electric lighting, his average cost for the last three years was £50; and yet his installation was old and inefficient. If he installed a coke-boiler, he was sure he could run his house much more cheaply than Dr. Smith. Electricians are rather prone to make comparisons between modern electric appliances and antiquated gas ones. On the whole, we do not think Dr. Smith's paper is going to be very helpful to the electricity industry. The "Electrical Review" gives excellent advice. It says: "It is clear that electrical men will do well to restrain their enthusiasm, when advising new consumers, particularly with regard to the continuous heating of rooms and water heating, lest they create too optimistic an impression in the first instance which will be rudely dispelled by the heating bills." It is also suggested that the cost of installation remains the chief difficulty.

More All-Electric Representations.

Electrical men in public are given to abusing the Legislature for putting obstacles in the way of the development of the electricity business; and, when they temporarily forget that stupid action of the Legislature, then they proclaim the wonderful success they are having in persuading or forcing people to live in all-electric houses provided by housing authorities. At one end of the country—Glasgow, for example—we hear of the contentment of the users of electrical appliances, despite the fact that, in the case of electric cookers, maintenance has not been found negligible. It is hoped, however, that with improved types the ability will come to eliminate, or at least to reduce, the cost under this head. At the other end of the country—Woolwich, for example, where there are some 670 all-electric houses—the Borough Electrical Engineer states that the Council have found the want of education of women in the use of electrical domestic appliances a very great problem; and the same gentleman says, unless they educate the girls (who are the women of to-morrow, which goes without saying) in the use of electricity, they will be in difficulties all the time. So we go on, receiving indications here and there, by word of mouth, that the position is not altogether as represented by the electrical enthusiasts, which simply confirms the information voluntarily tendered to gas undertakings by distressed occupants of houses electrically equipped, some of whom are glad enough to make monetary sacrifices to get back to gas.

Money and Heat Expenditure.

At the Public Works, Roads, and Transport Congress, the electrical people managed, through the Incorporated Municipal Electrical Association, to get in a paper by Mr. R. Hardie, of the Glasgow Electricity Department, on the use of electricity for housing purposes. To some extent the contribution was merely a *réchauffé* of what has been previously heard from the author. He thinks that, if dwellings under housing schemes are to be in any degree consonant with the needs and desires of the people who are to occupy them, a generous measure of electric service will be required; and he is filled with optimism as to the glorious future. A supply of electricity is, or will be in the immediate future, available—if not in every hamlet, at least to every community of any size, at prices which will bring the commodity within the reach of the very poorest. In fact, like a good apostle, he asserts that there is no justification for any other than electric lighting to be introduced in any new dwelling. The wonderful thing is that while so many phrases of this order fall from the mouth of Mr. Hardie, numerous people increase or begin the patronage of gas, and a great many persons have, after an excursion into the electrical promised land, returned disappointed, and re-adopted gas. In the paper, the electrical equipment of 800 houses which the Glasgow Corporation have nearing completion was described. This is supplied free by the Housing Authority; and the Electricity Department kindly and not disinterestedly undertake the maintenance of the electric apparatus without charge to the housing authority or tenant. This means that the electricity consumers generally have to pay for the maintenance of the apparatus, of which policy no fault can be found if it is a universal one in the electricity supply area. As to cost, the author states that the tenants have the option of being charged by one of two methods. (1) The ordinary rate of 4½d. per unit for 800 hours' use of the maximum demand. This means: Three-apartment houses, 70 units per annum, at 4½d. per unit, £1 6s. 3d.; four-apartment houses, 100 units per annum, £1 17s. 6d.; five-apartment houses, 150 units per annum, £2 16s. 3d. All over these quantities is charged at ¾d. per unit. (2) The two-part tariff—a fixed service charge per annum, *plus* a charge of ½d. per unit for all current consumed as registered on the meter. The fixed charge is: Three-apartment house, 6s. 6d. per month; four-apartment house, 7s. 7d. per month; five-apartment house, 8s. 8d. per month. The majority of the tenants take advantage of the two-part tariff. Actual returns show that the average weekly bill for electricity is: In a three-apartment house, 3s.; in a four-apartment house, 3s. 6d.; in a five-apartment house, 4s. 6d. One other point—Mr. Hardie's family must be extraordinarily hardy; for it is marvellous how warm they can keep by expending 3412 B.Th.U. per hour in a room, 15 ft. by 12 ft. by 8 ft. 6 in. to the ceiling. Of course, different people prefer varied degrees of heating, and different rooms have also varied requirements. Mr. Hardie says a "deep-seated impression—widely held" is that, while the electric fire has many admirable features, only the rich can afford its use. A "deep-seated impression, widely held," must be the product of experience. We heartily congratulate Mr. Hardie not on his house, but on his and his family's moderate requirement for heat. He lives in a corner house, facing due east, where the sun rarely shines; and the largest room (dimensions already quoted) is heated "comfortably" on the average evening by the expenditure of 1 unit of electricity at ¾d. per unit. If wintry conditions prevail, the cost is 1½d. at the maximum. If this can be done throughout a Scottish winter, he thinks the electric fire can be recommended in other parts of the country. We devoutly hope we shall always be in a position to live in winter time beyond the heating prescription of Mr. Hardie. The skimping mania of electricians in the cause of enforced economy with their commodity as a heating agent is distinctly on the increase.

GAS ACTS FOR 1925.

We commence to-day our customary review of the Acts relating to gas supply which have passed into the Statute Book as the result of the work of the last session of Parliament. An indication will be given of the features of the Acts, and of the alterations which have been made since the main provisions of the measures were set out in the issues of the "JOURNAL" for Dec. 24 last (p. 842), Jan. 14 (p. 83), Jan. 21 (p. 142), and Jan. 28 (p. 210).

The BARROW-IN-FURNESS CORPORATION, in their Bill as originally drafted, sought power (in the part which dealt with their gas and electricity undertakings) to sell, let on hire, and maintain all kinds of gas apparatus and fittings, including engines; but subsequently this particular clause was withdrawn by the promoters. The Act gives them authority to provide, fit up, and maintain showrooms and offices, and, "by public advertisement or otherwise," to "publish and make known any matters connected with, or affecting, the sale of gas or electricity, and do all such other acts as they may deem expedient to assist, develop, or promote the use of gas or electricity." For stand-by supplies a charge may be made which shall, however, not exceed 5s. in respect of any quarter in cases where the nominal capacity of the meter through which the gas is supplied does not exceed 120 c.ft. per hour, or 25s. in respect of any quarter in cases where such nominal capacity exceeds 120 c.ft. but does not exceed 1500 c.ft. per hour. The period of error in defective meters is fixed on the customary lines. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, & Co.*]

The BEDWELLTY URBAN DISTRICT COUNCIL ACT contains a clause enabling the Council to sell to the Rhymney and Aber Gas Company, on such terms as may be mutually agreed, the whole or any part of the mains, pipes, and other apparatus used by the Council, for the purpose of supplying gas in such part of the Rhymney Valley within the urban district of Gelligaer as is situate between the Abertwsswg Brook on the north and the Cefn Brithdir Colliery pit on the south. Upon this sale being carried into effect, this part of the urban district of Gelligaer is to be excluded from the limits of the Council for the supply of gas and included within the limits of the Rhymney and Aber Gas Company. The provisions of the various Acts and Orders relating to the supply of gas within the existing limits of the Company will apply to the part now referred to. [*Parliamentary Agents: Messrs. Lees & Co.*]

The BEXHILL CORPORATION ACT did not receive the Royal Assent at the same time as the others reviewed here; and notice of it has therefore to be deferred until a later date.

The BLACKPOOL IMPROVEMENT ACT contains a number of gas clauses of a general character. The "mains of insufficient capacity" clause which appeared in the Bill has been replaced by the clause subsequently agreed between the railway companies and the National Gas Council. This clause appeared *in extenso* in the "JOURNAL" for June 3 last (p. 677), when it was incorporated in the Mansfield Corporation Bill. There were also originally clauses relating to tenant's liability for

sub-tenant's gas supply and power to refuse to supply gas in certain cases which are not to be found in the Act. The same remark applies to a clause which would have enabled the Corporation, in connection with their gas and electricity undertakings, to fit-up showrooms and offices and give demonstrations of the uses to which gas or electricity could be put. To the following clause: "The Corporation may levy and recover such charges as they think fit for taking the reading of any gas or electricity meter fixed in a house which is either in whole or in part let furnished, at the request of, and for the convenience of, consumers, at times other than those of the periodical readings," there has been added the proviso that "such charges" shall not exceed 1s. for each reading. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, & Co.*]

The Bolton Corporation Act deals, in Part VII., with gas matters. Among a number of clauses on customary lines is the agreed "relief from obligation to supply" clause, already referred to in connection with the Blackpool Improvement Act. Power is given to vary by agreement, and without preference, the price to be charged for gas according to the purposes for which it is supplied. The stand-by clause enables the Corporation to make a minimum charge not exceeding 40s. a quarter, notwithstanding that the ordinary charge for the gas actually consumed in such quarter would amount to a less sum—provided that in fixing the amount of such minimum charge the Corporation shall have regard to the probable maximum supply of gas which might at any time be required for such premises; and no such sum as aforesaid shall be fixed in the case of any premises in respect of which gas is supplied by the Corporation only through a meter of not greater capacity than a No. 3 standard meter or a meter having a normal capacity of less than ten lights. By a clause added to the Bill the Corporation are, from the next meter reading after the passing of the Act, to make a uniform charge for gas throughout the limits of supply; and agreements made between the Corporation and the Horwich Urban District Council are annulled. The Corporation are given power to borrow £10,000 for ten years for gas meters, and £190,000 for twenty-five years for the general purposes of the undertaking. There is also power to borrow further money with the consent of the Minister of Health. [*Parliamentary Agents: Messrs. Dyson, Bell, & Co.*]

The Burnley Corporation Act provides that, notwithstanding anything contained in the Sale of Gas Acts, 1859 and 1860, the Justices of the Peace for the Borough may adopt these Acts, and may from time to time delegate any of their powers and duties under the Acts (except the appointment or dismissal of inspectors of gas meters) to a committee of their own body. This differs from the clause in the Bill by which the Corporation sought power to adopt the Acts referred to, and to provide a meter testing station at the gas-works. The alteration was made at the suggestion of the Board of Trade. The residuals clause is on the lines of the Model Bill, with the addition of the words "on any lands upon which they are for the time being authorized to manufacture gas or work up and convert residual products," manufacture other products, &c. The stand-by clause provides that a person shall not be entitled to demand a stand-by supply of gas for any premises (other than a dwelling house) unless he has agreed to pay to the Corporation such minimum annual sum as will give them a reasonable return on the capital expenditure incurred by them in providing such stand-by supply, and will cover other standing charges incurred by them in order to meet the possible maximum demand for those premises—the sum to be paid to be determined, in default of agreement, by arbitration. A clause to amend section 20 (satisfaction for accidentally damaging pipes, &c.) of the Gas-Works Clauses Act, 1847, to read, in its application to the Corporation, as if the words "ten pounds" were inserted therein, instead of "five pounds," was deleted. The Home Office view was that this provision should not be extended further. There is a section regulating the sale, &c., of coke. The Bill, in connection with an alteration of boundary, proposed that the limits of the Corporation for the supply of gas should be extended so as to include the added part of Padiham, the added part of Ightenhill, and the added part of Habergham Eaves. By the Act, the extension is to include "the added part of Ightenhill and the added part of Habergham Eaves." [*Parliamentary Agents: Messrs. Sharpe, Pritchard, & Co.*]

The Gas Light and Coke Company's Act provides for the transfer to them of the undertaking of the Brentford Gas Company, for the conversion of 10 p.ct. bonds into a proportionate capital sum of 3 p.ct. consolidated debenture stock, and other matters. The date of transfer of the Brentford undertaking is to be Jan. 1, 1926. Holders of "A" and "B" ordinary stock in the Brentford Company are to receive for every £100 of stock £120 of ordinary stock of the Gas Light and Coke Company; holders of 5 p.ct. preference stock will receive for every £100 of stock £125 of 4 p.ct. consolidated preference stock of the Gas Light and Coke Company; holders of 4 p.ct. debenture stock will receive for every £100 of stock £133 6s. 8d. of 3 p.ct. consolidated debenture stock of the Gas Light and Coke Company; and holders of 6 p.ct. redeemable debenture stock will receive for every £100 of stock £100 of 6 p.ct. redeemable debenture stock of the Gas Light and Coke Company. The mortgage bonds of the Brentford Company outstanding at the date of transfer will become mortgage bonds of the Gas Light and Coke Company. The Act creates such amounts of stocks of the Gas Light and Coke Company as may be necessary to carry out these provisions. In the original Bill, the 6 p.ct. Brentford redeemable debenture stock was to be redeemed by the Gas Light and Coke Company upon the same terms and conditions as applied to the Brentford Company. The clause in the Act states that it shall be redeemable by the Gas Light and Coke Company "on Jan. 1 or July 1 in any year on six months' notice in writing addressed to each registered holder thereof, by the payment in cash to each holder of such debenture stock of a sum calculated at the rate of £106 for each £100 of such debenture stock held by him, in addition to the interest on such debenture stock accrued up to the day immediately preceding the date of redemption."

Directors of the Brentford Company are to receive as compensation for loss of office a sum of money equivalent to seven years' purchase of the annual amount of their remuneration (with the income-tax thereon) on July 25, 1924. To the auditors is to be paid a sum equal to three years' remuneration (with the income-tax thereon); and there are provisions for compensating staff officers who may be willing to enter the service of the Gas Light and Coke Company, but whom that Company may elect not to take over. A staff officer declining to enter the service of the Gas Light and Coke Company is to be paid by that Company any sum or periodical allowance or payment to which he would have been entitled, on retiring voluntarily on the date of transfer from the service of the Brentford Company, to receive under any superannuation, pension, or benevolent scheme, out of the fund formed under such scheme.

From the dates of the meter readings for the December quarter, 1925, in the Brentford district, the price charged for gas to the Brentford consumers shall exceed by the following respective amounts per therm the price for the time being charged by the Gas Light and Coke Company for gas supplied to private consumers in that part of their area north of the Thames:

Year.	Amount.
1926	One and two-fifths pence in so much of the Brentford district as comprises the Richmond district, and one penny in the remainder of the Brentford district.
1927	One penny throughout the Brentford district.
1928 and 1929 . .	Four-fifths of a penny do.
1930 and 1931 . .	Three-fifths of a penny do.
1932 and 1933 . .	Two-fifths of a penny do.

After the last-named year the price is to be the same to the Brentford consumers as to those in the Gas Light and Coke area. During the time that these differential prices are in operation the rates for gas supplied to the Brentford consumers are not to be taken into account in connection with the sliding-scale.

In the Bill as originally drafted there was provision for a differential price of one-fifth of a penny per therm throughout the Brentford district during the years 1934 and 1935.

In the portion of the Act empowering the Company to close a portion of Nine Elms Lane, and to construct a new street in lieu thereof, clauses have been inserted for the protection of the Postmaster-General and the Metropolitan Water Board. Similarly, in the part dealing with the stopping-up of certain footpaths, there are clauses for the protection of the London County Council and the Harrow-on-the-Hill Urban District Council. A schedule to the Act names certain additional lands on which the Gas Light and Coke Company may manufacture gas, &c.; these being in the borough of Battersea and in the urban district of Brentford. To the clauses relating to this matter there has been added a proviso that, as regards the land in the urban district of Brentford, the provisions "shall not have effect until the expiration of ten years from the date of the passing of this Act; and that as from the date of transfer and until the expiration of the said period of ten years the Gas Light and Coke Company shall have, and be entitled to exercise, with reference to those lands the like rights (and no other) as the Brentford Company would have had, and been entitled to exercise, if this Act had not been passed. Originally there were clauses in the Bill enabling the Company to supply power gas; but these were subsequently withdrawn by agreement between the Company and the various local authorities. [*Parliamentary Agents: Messrs. Dyson, Bell, & Co.*]

(*To be continued.*)

Wales and Monmouthshire Junior Gas Association.—On p. 726 of the "Journal" for the 16th inst., Mr. T. A. Canning, speaking on Mr. Hughes's paper, is reported as having said (eight lines from the bottom of the first column): "On a 20-B.H.P. plant, this would make the respective costs per hour: Electricity, 1s. 4·6d.; and gas (at 9d. per therm), is 3·3d." The latter figure should have been 1s. 3·3d.

Sir John Cass Technical Institute.—The prizes and certificates awarded to students of the Institute were distributed on Tuesday, Dec. 15, by Sir Thomas Kirke Rose, D.Sc., A.R.S.M. As on previous occasions, they included prizes presented by the Directors of the South Metropolitan Gas Company, on the results of the work done in the Departments of Chemistry and Physics and Mathematics by students in their employ. An interesting appointment to a new post at the Institute is that of Mr. Francis White, B.Sc., as Lecturer in Gas Manufacture.

THEORETICAL ASPECT OF STEAM RAISING FROM WASTE HEAT.

By WILLIAM ROBERT THOMSON, B.Sc.Tech., Assoc.M.Inst.C.E.

[Abstract of a Paper communicated to the Institution of Civil Engineers.]

Composition and Weight of Flue Gas.—The author first shows that in both elementary flue gas and in flue gas with excess air the nitrogen content is constant and 79 p.ct. by volume, while the carbon dioxide in the former, and the sum of the carbon dioxide and oxygen in the latter, is correspondingly constant and 21 p.ct. by volume. The excess air percentage is thus easily obtained from the proportion of oxygen in this 21 p.ct.

Analyses should state the water vapour content present, since both the weight and the specific heat of the waste gas are very largely affected by the presence of a comparatively small portion of water vapour.

The accepted basis of weight of flue gas is per unit weight of carbon burnt in the producer. The flue-gas weights for (1) elementary flue gas, (2) that with excess air present, and finally (3) that with water vapour, being determined, the weight per unit weight of carbon burnt may be obtained immediately on analysis.

The fact that practical flue-gas analyses do not agree with the theoretical analyses as shown by the nitrogen content in the "dry" analysis is noted; and the author considers that leakage of gases other than air occurs, which must take place from the retorts. Where coal gas is being made in the retorts, an analysis of this coal gas indicates the proportion of carbon to hydrogen in the gases leaking into the flue gas. The carbon escaping from the retorts is accounted for in a "leakage factor," by which the actual weight of flue gas per lb. of carbon present in the flue gas must be multiplied to give the weight of flue gas per lb. of carbon actually burnt as fuel in the producer.

Specific Heat.—Values for the true specific heats[1] of the gases under consideration are plotted to form curves over the required range of temperature; and linear approximations are obtained for each gas excepting steam, the curve for which is too pronounced for a linear approximation. The mean specific heat lines obtained from these true specific heat approximations are plotted together; and a series of lines have been prepared which give the mean specific heat of any dry flue gas for varying oxygen percentages. Mean specific heat curves are used for steam over the required range of temperatures. Finally, the mean specific heat for "wet" flue gases is obtained.

Charts.—A simple chart is used for the total heat in steam of any quality; and a set of eight charts has been prepared to save calculations in obtaining percentage of water vapour by weight, weight of flue gas per lb. of carbon present, leakage factor, &c.

Example.—

Data: Steam at 120 lbs. per sq. in. gauge and 150° Fahr. superheat.
Feed-water at 50° Fahr.
Carbon in coke burnt, 88 p.ct.
Flue-gas analysis ("dry") at entrance of boiler
O_2, 4·2 p.ct. by volume.
CO_2, 15 p.ct. by volume.
N_2, 80·8 p.ct. by volume.
Water-vapour, 4·5 lbs. per 1000 c.ft. of flue gas at S.T.P.
Inlet temperature, 674° C.
Outlet temperature, 177° C.
The coal gas made had a C : H_2 ratio of 2 : 1.

Conversion to Wet Analysis.—

$$4\cdot5 \text{ lbs. per 1000 c.ft.} = \frac{4\cdot5}{0\cdot504} = 8\cdot9 \text{ p.ct. by volume.}$$

O_2	4·2	4·2 × 0·911 =	3·8	
CO_2	15·0	15·0 × 0·911 =	13·7	100 p.ct. "wet" analysis.
N_2	80·8	80·8 × 0·911 =	73·6	
H_2O	8·9		8·9	
	100 p.ct.			

Weight of Flue Gas per lb. of Carbon.—

$G' = 17\cdot9$ lbs. per lb. of carbon in composition using the "wet" analysis.
$W = 5\cdot5$ p.ct. by weight water vapour in flue gas.
Since in the "dry" composition the nitrogen content is greater than 79 p.ct., leakage of coal gas has occurred from the retorts.
C to H_2 ratio D is 2 : 1.
$CO_2 + O_2 = 15 + 4\cdot2 = 19\cdot2$ p.ct. by volume in "dry" composition.
Leakage factor $L = \dfrac{12y}{12y - D\,[106 - 5\cdot06\,(x + y)]} = 1\cdot13$, where x denotes the oxygen, and y the carbon dioxide content by volume in the "dry" analysis of the flue gas.
Then weight of flue gas per lb. of carbon burnt in producer, $G = 17\cdot9 \times 1\cdot13 = 20\cdot2$ lbs.

Mean Specific Heat of Dry Flue Gas.—

$t_1 = 177°$ C.
$t_2 = 674°$ C.
Oxygen content in "dry" composition = 4·2 p.ct.
Mean specific heat between t_1 and t_2 $C_E = 0\cdot248$.

Mean Specific Heat of Water Vapour.—

$C_W = 0\cdot486$.

Mean Specific Heat of "Wet" Flue Gas.—

$$C_\theta = \frac{100 - 5\cdot5}{100} \times 0\cdot248 + \frac{5\cdot5}{100} \times 0\cdot486.$$
$$= 0\cdot261.$$

Heat taken from Flue Gas.—

$$H = GC \times \frac{9}{5}(t_2 - t_1) \text{ B.Th.U. per lb. of carbon burnt.}$$

Heat in Steam Raised.—

Total heat $H_s = 1254$ B.Th.U. per lb.
Evaporation factor, $H_s/970\cdot4 = 1\cdot293$.

Weight of Steam Raised.—

Temperature drop $= t_2 - t_1 = 497°$ C.
Assume tube efficiency $\eta = 0\cdot95$ p.ct.
Steam raised from and at 212° Fahr. per lb. of carbon burnt in the producers $= \dfrac{\eta G C_\theta}{970\cdot4} \times \dfrac{9}{5}(t_3 - t_1) = 4\cdot5$ lbs.

Actual steam raised per lb. of carbon burnt $= \dfrac{4\cdot5}{1\cdot293} = 3\cdot5$ lbs.
Actual steam raised per lb. of coke burnt $= 0\cdot88 \times 3\cdot5 = 3\cdot1$ lbs.

[1] Taken from "Specific Heats of Gases," by J. R. Partington and W. G. Shilling. London, 1924.

NEW COAL-TREATMENT LABORATORY AT BIRMINGHAM UNIVERSITY.

At a meeting of the South Staffordshire Institution of Mining Engineers on Monday, Dec. 14, Prof. K. Neville Moss, M.Sc., of the Mining Department of the Birmingham University, read a paper on the new coal-treatment laboratory at that University.

EQUIPMENT OF THE LABORATORY.

The equipment already installed consists of a British Baum coal washing plant of a capacity of 5 tons per hour; and a pulverized fuel plant, furnace, and boiler. The plant to be installed during the next three months includes a Draper washer, a "Universal" concentrator table, a pneumatic separator, a spiral separator, a complete briquetting plant, and a screening plant.

SUBJECTS TO BE STUDIED.

Coal screening and washing, said Prof. Moss, is a subject which will be studied; and the equipment of the laboratory will afford the means of ascertaining the best cleaning process to be applied to any particular coal. Also, much experimental work is necessary on briquetting; and it is proposed to:

(1) Study the effect of blending coals, more particularly in connection with the production of clinker when burnt as briquettes.
(2) Establish the relationship between the pressure applied in briquetting and the coherence of the briquettes produced.
(3) Determine the effect of grinding both the coal and the pitch to varying degrees of fineness.
(4) Study the relative values of different binders, and the quantity of each necessary to give maximum coherence.
(5) Investigate the temperature of the cooking process, and the amount of steam required.

The economics of coal-briquetting centres round the binder used. If a cheap ash-free binder can be found, the process will be rendered economically sound, and a good market for the manufactured product ought easily to be secured and maintained.

It is the intention of the Mining Department of the University to thrash out many problems in connection with the burning of pulverized fuel. Also, it appears that colloidal fuel is a subject for careful investigation.

CARBONIZATION AND LIQUEFACTION OF COAL.

It is not intended to investigate problems concerned with the carbonization and liquefaction of coal. Concerning high-temperature carbonization, Prof. Moss said that others of far wider experience and training are devoting attention to it. As to low-temperature carbonization, the Fuel Research Board, individual research workers, and companies, have devoted much time and money to the problem, and valuable scientific data have been obtained; but a commercial proposition is still far away. The complete and partial gasification of coal, remarked Prof. Moss, is an important subject, and will demand more attention; but the science and technique of the gas industry is of a high order, and is capable of solving many of its own problems. At present complete gasification is not economical, but it may become so. It is not intended that the Mining Department of the University should devote attention in their new laboratory to the liquefaction and hydrogenation of coal.

Gas for Brick Burning.—Referring to seasonal uses for gas, Messrs. Harvey and Clark, in a paper presented to the American Gas Association, mentioned as an important one the burning of common brick, which is now being done very successfully with town gas. This, they pointed out, offers a demand for gas during the summer months only, and therefore offsets the general peak demand of the winter months. Such business beneficially affects conditions.

RELATION BETWEEN HEATING VALUE OF GAS AND ITS USEFULNESS TO THE CONSUMER.

Critical Review of Published Data.

For many years the question of the relative usefulness of gases of different heating values has been a subject of great interest to the gas industry, and until recent times one of more or less active controversy. Indeed there are still some who believe the meter readings are a true measure of the service rendered, without much regard to whether the gas metered has a high or a low heating value. The work done on this subject, however, has demonstrated in the main that the available heat delivered in the form of gas is the useful commodity for which the consumer pays. The importance of the subject cannot be overestimated; and consequently Technologic Paper No. 290, of the Bureau of Standards, U.S.A., which is a critical review of the published data on the problem, is of great interest and value. Mr. E. R. Weaver was responsible for the work. Approximately three hundred articles which had a bearing on the subject were scanned, and those which seemed important were carefully read. The public service commissions of all the States were asked to supply any data; and a similar request was made to the President of the American Gas Association. The review when completed was submitted for criticism to this Association, which appointed a Committee for the purpose. It is, therefore, as was stated in the "JOURNAL" for Nov. 4, the most comprehensive collection of data on the subject which has yet been published.

CHARACTER OF AVAILABLE DATA.

The data available are of two kinds. There is direct observation of the useful effect which may be obtained by burning gases of different heating values in representative appliances; and the amount of gas burned by all the consumers of a gas company or by a selected group of customers before and after the heating value of the gas has been changed. And, as Mr. Weaver so rightly stresses, a distinction should be made between these two kinds. Accurate tests of performance of appliances give definite and reproducible results, of the significance of which there can be little doubt. There is, therefore, little chance for personal judgment or prejudice to enter into their interpretation. On the contrary, personal judgment is unquestionably an important factor in the selection and evaluation of data relating to consumption.

The question has been an active one for twenty or thirty years; one of the first investigators being Thomas Fletcher, who published his results in the "JOURNAL." [These results are summarized briefly by his son, T. W. Fletcher, in Vol. 144, p. 315.] It is unnecessary in this short review of the report to recount in any detail the work of the early investigators. At the same time it is interesting, at this stage in the development of the question, to reflect on their findings, which for the most part went to show that, to perform a definite amount of work, the consumption in B.Th.U. remains substantially the same, irrespective of the calorific value of the gas.

RESEARCH BY BUREAU OF STANDARDS.

In 1913 the Bureau of Standards began an investigation which was continued, with some interruptions, till 1917. Mr. Weaver states that, within the range of heating values covered, —500 to 725 B.Th.U.—the experiments constituted probably the most thorough study of the use of gas ever made. They not only included direct comparisons of a number of gases under conditions assumed to be comparable, but, in addition, a detailed study was made of the effect of varying each condition which might influence the result. As nearly as can be ascertained, 1661 efficiency tests were made with top burners, 65 with ovens, 69 with an instantaneous water heater, 59 with a tank water heater, 87 with a muffle furnace, and 74 with a platinum crucible in an open flame. The whole research showed that the different gases could all be used with substantially equal efficiency in all the appliances investigated.

Probably the work most frequently referred to by the advocates of the idea that gases of low heating value are more efficient than those of high heating value is that of W. H. Y. Webber. In the report under review, the critic points out that Webber's data do not include the time required to boil water, which must have been greater for the gases of lower heating value. It is hard to see, states Mr. Weaver, how the advocates of a low calorific standard can have interpreted these data as indicating generally higher efficiency for gases of lower heating value.

Considerable space is devoted to an admirable summary of the work of the Gas Investigation Committee of the Institution of Gas Engineers, whose conclusion—that for all practical applications the value of gases ranging from 240 to 550 B.Th.U. per c.ft. was directly proportioned to the heating value —is well known to every gas engineer in the country. It is interesting to observe that this conclusion is the same as that of the Bureau of Standards, so that the gases studied range from 240 to 725 B.Th.U. per c.ft

An investigation ranking in thoroughness with those of the Institution of Gas Engineers and the Bureau of Standards, and, like the former, carried out in the main by representatives of the gas industry, was that of the Joint Committee on Efficiency and Economy of Gas of the Railroad Commission of California. The research is particularly valuable because it included and correlated studies of the efficiencies of modifications of the manufacturing processes, direct determinations of the relative efficiency of use of various gases, and statistical studies of the use of gas by consumers. The gases studied range from 500 to 600 B.Th.U.; and once again the result of the investigation was the same as those of the other two bodies mentioned.

RECENT WORK.

In dealing with recent investigations, the report draws attention to a paper by George Keillor (see "JOURNAL," Vol. 158, p. 93) which is, in general, an argument in favour of gases of low heating value. Keillor asserts that gases of low calorific value can be used with greater efficiency than can gases of high heating value. Fortunately, says the critic, he gives the evidence on which his assertion is based; and a comparison of the figures shows at once that there is an appreciable increase in efficiency in the use of gas of low heating value only when the time required for the operation is left out of account. In practically all domestic burners some thermal efficiency has to be sacrificed to speed; and the use of less heat per unit time, whether accomplished by turning-down the burner or reducing the calorific value of the gas supplied, is accompanied by a loss of time and a gain in efficiency. If, continues the critic, Keillor's observations upon the same appliance are compared by plotting the thermal efficiency against the rate of heat supplied or against the time required to perform a given operation, it is apparent that the gases of lower heating value were not more efficient, but rather the contrary. The observations of G. E. Whitwell, frequently referred to in the literature on this subject, appear to fall in the same class.

THE QUESTION OF WASTE.

It is claimed by some that lean gas has an advantage as compared with rich gas in that less waste of heat results from its use. The Bureau of Standards do not believe that any considerable weight should be placed upon this claim. In general, they argue, burners must be adjusted to give a certain maximum rate of heat supply per hour when fully turned-on, for the possible speed of the operations desired would be less with a reduced rate. The present adjustments have resulted largely because the experience and preferences of the gas user make these adjustments most satisfactory, all things being considered. It seems, therefore, that any change in gas quality will sooner or later bring about readjustment of appliances, or changes in pressure or other conditions of supply, so that eventually the average rate of burning for any sort of operation would give substantially the same B.Th.U. per hour as now prevails. Hence the waste of gas when a burner is kept in operation needlessly will be the same with the lower-heating value as it is with the present gas of high calorific value. Also, why should the operator of gas appliances turn-off the gas more with one than with the other gas?

More than fifty pages of the report are taken up by statistics regarding the relative amount of gas used before and after changes of heating value, and there is a section devoted to data of the use of gas by selected groups of consumers. The latter is a compromise between direct determination and statistical study, and does not possess in full the merits of either method, but has the faults of both. Summarizing the results, the critic concludes that consumption changes a little more than in inverse proportion to a change of heating value. But it must be remembered, he states, that, because of the great number of other factors affecting consumption, the statistical method is a very indirect, uncertain, and highly theoretical method of determining the usefulness of different gases to the consumer, and can never have more than a small fraction of the value of the direct and simple observation of the actual performance of appliances.

LOW-HEATING VALUE GASES, AND COMPLAINTS.

One of the most important arguments made in favour of a lower heating value standard is that the number of complaints received by the gas company is not increased, but rather reduced, at the time of the change of calorific value. This seems to apply only in those cities in which the consumers' appliances have been generally readjusted for gas of the new standard. When a house-to-house canvass is made, and every appliance correctly adjusted to the new quality, complaints decrease. Surely there is nothing strange in this. All experience shows that gas of low heating value can be burned satisfactorily in properly constructed and adjusted apparatus. If adjustments are well made at the time of the house-to-house inspection of the appliances, many of which had probably not been cleaned or adjusted for years, the apparatus should be in a far better condition to give service than before the change of heating value. Therefore, it is not to the credit of the new standard that complaints are reduced. The same thing would happen in the case of any general inspection of appliances and conditions of service in the homes of consumers.

Stress is laid on the fact that consumers are concerned not with the cost of gas per 1000 c.ft., but only in receiving a continuous supply at satisfactory pressure and at the lowest possible cost per B.Th.U.

To sum up: The usefulness to the consumer of a given volume of gas is accurately proportional to its heating value.

NOTES FROM ABROAD.

[From recent issues of the "Journal des Usines à Gaz."]

COKE GRADING.

The Central Coke Committee early this year adopted an official calibration and nomenclature for coke sizes; tests to be carried out with a hand sieve fitted with one of four standard square-meshed screens. The names and sizes are as follows:

Through—	
12 mm.	Dust.
23 mm.	Breeze.
34 mm.	No. 0.
45 mm.	No. 1.
Above	No. 2, or "large."

The standard sieve consists of a wooden frame 70 cm. long, 50 cm. wide, and 20 cm. deep. Two handles are fitted to the short sides; and the standard screens are removably attached to the under-side.

SULPHATE IN NORTH AFRICA.

During 1923 and 1924 there was a notable increase in the demand for sulphate in Algeria, due to the propaganda efforts of the local branch of the French Nitrogen Bureau. In 1913 and until 1923 the consumption was steady at about 1800 metric tons; but the figure jumped to 2700 m. tons in 1923, and again to 5000 m. tons in 1924. That sulphate finds special favour in Algeria is shown by the fact that in the latter year there was consumed only 400 m. tons of cyanamide, 500 m. tons of nitrate of lime, and 600 m. tons of nitrate of soda. Only about 350 m. tons of sulphate are made by the gas-works in Algeria; the remainder being imported.

As for prospects, in Morocco the nature of the soil, climatic conditions, and methods of agriculture allow little hope of developing the use of sulphate; and the dryness of Tunis makes the same remark applicable to that region. Algiers, on the other hand, holds out hope of a still larger consumption, providing the utmost care is taken in marketing the product and studying the conditions of climate, rainfall, temperature, irrigation, &c., best suited for its application.

DEBENZOLIZATION FOR ITALY.

The removal of light oils from gas is to be compulsory for Italian gas undertakings, except the smallest ones. The Statute is dated April 17, 1925, and modifies the law of Sept. 6, 1923. The most important clauses are as follows:

"Gas lighting undertakings producing more than 2 million cub.m. per annum are forbidden, as from the expiry of a term fixed for each by the Minister of National Economy and in every case not later than Jan. 1, 1926, to sell gas from which there have not been removed the light oils used in the production of benzole and toluole to the extent of not less than 15 gr. per cub.m. of coal gas. For such undertakings as come within the above category, there must not be prescribed a higher calorific power than 4500 calories per cub.m. dry at N.T.P.

"As from the date of the decree, all gas-works, coke ovens, tar distilleries, and tar retailers are forbidden to sell, or even to utilize direct, their coal-gas products unless the coal tar has been submitted to a process for the recovery of light oils distilling over up to 170° C. at a pressure of 760 mm. of mercury. Tar producers shall be exempt on distilling their tar, provided that the output is disposed of to national distilleries to which the obligation of light-oil removal is transferred. In the event of dispute between producer and distiller, the price of the tar shall be fixed by a committee of arbitration of three members nominated by the Minister of National Economy—one from his department, acting as President, and one from each of the applicants.

"Gas-works whose production is less than 500,000 cub.m. per annum, and which are more than 200 km. from a tar distillery, shall, upon the favourable report of the Prefect of their province, be relieved of their obligations by the Minister of National Economy."

Other clauses prescribe penalties and provide for the setting-up of the necessary organization and personnel.

FIRST BENZOLE ORDERS IN FRANCE.

The "Journal Officiel," dated Oct. 23, 1925, contained the first two Orders made by the Minister of War and the Minister of Commerce in accordance with the law July 22, 1923. It is prescribed that:

"The Paris Municipality shall undertake and complete, within two years from the date of the present Order, the construction of plant and installations capable of treating for benzole extraction the whole of the coal gas produced in the concessionary area of the Société du Gaz de Paris. In respect of future gas-making plants a similar period of grace of two years shall be granted. At the expiry of the two years, the Municipality shall report to the Government Departments concerned.

"The plant and appliances shall be maintained, save for accident or technical or economic difficulty, in order for continuous working; and any total or partial stoppage of more than eight days shall become immediately the subject of a special report by the Société du Gaz de Paris to the Government Departments concerned."

A similar Order has been issued in respect of the Société d'Eclairage, Chauffage, et Force Motrice; others will shortly be issued applying to the more important gas undertakings, when the special Commission set up by the Order of Jan. 15, 1925, shall have completed its study of the circumstances of each town.

FACTORS IN THE CHOICE OF CALORIFIC VALUE.

A paper on this subject was read by Prof. Dr. Karl Bunte at this year's meeting of the German Gas Association at Cologne, and the full text appeared in "Das Gas- und Wasserfach" for Sept. 19 and 26.

It may be taken as agreed, the author surmises, that the best means of business expansion is the supply of good gas at a low price, and similarly that "good gas" implies, above all, gas of uniform quality. To a certain extent, also, there is agreement that gas should be of uniform quality not only in each locality, but throughout every area of supply. It is, he acknowledges, rather the makers of apparatus than those who supply gas who lay stress on this general uniformity. The difficulty begins when the question arises, What shall be considered a normal gas?

Contrary to the practice of complete freedom in industry in this country, the German Gas Association makes a strong recommendation that undertakings should conform as far as possible to a certain standard which it lays down as normal, and which has been adjudged as most universally suitable after the fullest consideration.

Dr. Bunte, in discussing whether there are serious disadvantages in fixing a universal standard, points out that, when the Association first recommended one in 1921, the English industry was just beginning to rejoice in its new-found freedom. It must, however, be more than a coincidence, and rather in the natural order of things, that, after four years of this freedom, the vast majority of English undertakings are to-day working either at 450 B.Th.U. or at 500 B.Th.U., with the remainder nearly all at standards between these round figures, and but a negligible few at anything higher. In other words, the English industry has recognized the advantages of making full use of water gas, and supplying gas of lower calorific value. Further, this self-established standard in England of 450 to 500 B.Th.U. per c.ft. represents 4000 to 4450 calories per cub.m., which is very near the 4000 to 4300 which the Association now recommends, after the most careful consideration, as the most suitable for modern conditions. In the same way, it is found that nearly all countries have gradually adopted approximately the same standard, while making economic use of water gas admixture. The German gas industry, Dr. Bunte remarks, must first persuade itself, and then its public, that this is not an aftermath of war expedients, to be abandoned as soon as practicable, but a thoroughly sound item of modern gas practice, permanently justified by both technical and economic considerations. Moreover, it is advocated for other reasons than solely as a means of reducing the calorific value.

Other recommendations of the Association are that great attention should be paid to uniformity in calorific value, specific gravity, and pressure. Specific gravity should not exceed 0·5, and purity from sulphuretted hydrogen, ammonia, and tar is of first-rate importance.

Some of the main points of the paper may be summarized as follows: After due consideration of various other suggested processes, main and auxiliary, for the provision of a central supply of high-grade gas for household and industrial purposes, Dr. Bunte comes to the conclusion that, if an entirely fresh start had to be made now, gas supply would still be based on the principles with which it started more than a hundred years ago—that is to say, upon the principle of the coking of coal, and the direct production of heating gas from coal and coke. This he maintains in spite of the frequency with which technical men announce new methods which are going to revolutionize the industry, and the scorn with which laymen are apt to refer to the "methods of Murdoch and Clegg."

The maintenance of equilibrium between the demand for gas and the demand for coke must, to a very large extent, be the object to aim at in connection with supplying as cheap a gas as possible.

Since the industry has now to supply heating gas, and no longer gas based on its illuminating value, nearly all countries are agreed upon a reduction of the calorific value. The high calorific value formerly maintained was, in fact, due principally to the presence in the gas of the illuminating constituents.

With regard to the carbon monoxide question, Dr. Bunte remarked that, in other countries, officialdom has probed the question with the greatest care. The conclusion reached has, in every case, shown that the danger is grossly exaggerated, largely through the efforts of trade rivals and sensation-mongers; that between two and three persons per million, including suicides, meet their end by it; and none of these authorities has felt justified in obstructing a technical development which, in other directions, benefits humanity in a thousand ways.

"A CENTURY OF LIGHTING."

Published on the Occasion of the "I.C.G.A." Centenary.

To M. Eg. van der Geten Adry, Chief of the Coke Department of the Imperial Continental Gas Association at Antwerp, we are indebted for a copy of this admirable book, brought out to commemorate the completion of a hundred years' existence of that august corporation.

In dedicating the work to Mr. A. F. P. Hayman, the Association's Managing Director in Antwerp, the author describes it as an "historic study;" and, indeed, the amount of research and difficult compilation evidenced in the 164 quarto pages, profusely illustrated, of the volume, fully merit the description. The "Archiviste-adjoint" of the City of Antwerp, in a preface, assures M. Adry that he has "enriched the crowded library of Anversois history."

The first three chapters take the reader quickly through the history of lighting from the earliest times, even from the legend of Prometheus; and the review is most engrossing. We learn that petroleum was known in the ancient temples of Asia, and that the splendour of Egyptian dynasties placed bronze lamps throughout the streets, each consuming 60 to 70 kilos of oil or fat per day. We read with disquietude of the habit of young Roman lovers, their serenades disregarded, of leaving their torches burning outside their ladies' premises; and, with satisfaction, of the belated constitutional taken by Mme. de Sévigné at midnight after supper, when in 1666 she found the Faubourg St. Germain lighted by candles. In those days, anyone could throw stones through the lanterns, merely at risk of the galleys.

To chapter 4 we hope to return in some later issue of the "Journal." It presents once more, and in greater detail than usual, the claims of France and England to have produced the inventor of gas lighting; but here we find that Murdoch and Lebon take second and third place respectively, for the Belgian Jean-Pierre Minkelers is championed by M. Eg. Adry. Set forth in historic fashion, with extracts from archives and contemporary sources, the case seems irrefutable; and we hope in due course to find the opportunity for publishing a translation of the greater portion of the chapter.

Thereafter, attention is turned to the lighting of the City of Antwerp in particular; and the events and negotiations which led up to the concession granted on Jan. 18, 1840, to the Imperial Continental Gas Association, "which in the early years found so many difficulties in the way of success, but whose chiefs, never wearying, never admitting failure, discouraged by no circumstance or person, have left to the City a legacy in the form of lighting worthy of its world-wide renown as a centre of art and commerce." The inventory of the gas-works, taken over in 1840 by Mr. G. W. Drory on behalf of the "I.C.G.A.," gives a good idea of what a works was 85 years ago. The buildings were quite near the scene of the last guillotining in Antwerp; the works covered 3000 sq.m., and included two gasholders 5 m. in diameter—one called "St. André," the other the "Vierge Marie." The meters numbered 15. Fixtures were valued at 33,000 fr., and the holders at 7000 fr.; and the "I.C.G.A." secured the whole property for 175,000 fr.

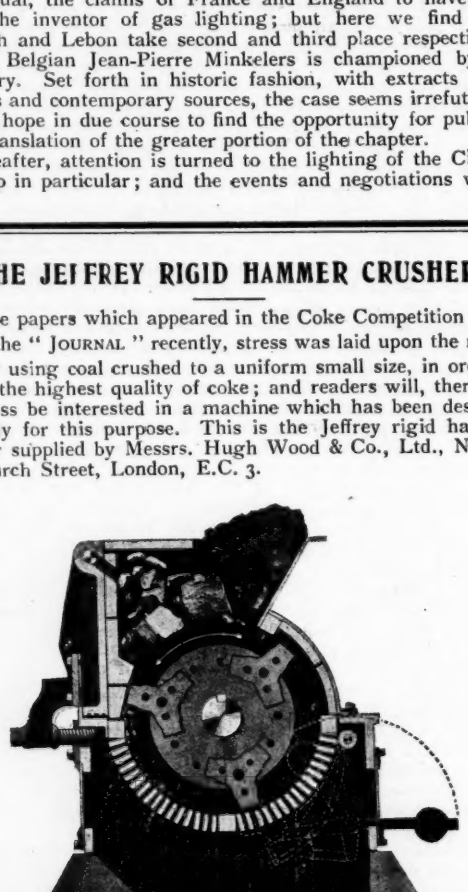
Early difficulties protrude from the report submitted to the London Directorate by M. Etzerodt in November, 1847. He opined that time would be required for people to change their habits and ideas—especially in a continental town; and that the nature and prejudices of the people, and the supply of cheap and good oil, contributed to retard the progress of gas. The cost of fittings, too, was beyond the means of shopkeepers. Cheapness of gas and of fittings was considered the only avenue for an extension of the system. Eighty years ago, and still true in many parts even of this country! As for early prejudices, M. Adry has unearthed an old placard reading "House to Let—Not lighted by Gas," and compares it with the modern advertisement "Gas on Every Floor."

After dealing briefly with the birth and development of gas lighting in Brussels and Ghent, the author gives further evidence of the depth of his study by including a chapter of folk-lore poems and ditties in the Flemish tongue. There follow short biographies and portraits of the veterans of the Association, and a closing chapter referring specially to its centenary. Here we find references to the souvenir book and the historic prospectus, which we reviewed in the "Journal" for Dec. 10, 1924.

Artistically printed and excellently illustrated in black-and-white, coloured prints, and photographic reproductions, "Un Siècle d'Eclairage" is a volume at once valuable and entertaining; and we congratulate M. Adry. Further, we compliment the "I.C.G.A." upon having in their service an historian and an enthusiast.

THE JEFFREY RIGID HAMMER CRUSHER.

In the papers which appeared in the Coke Competition number of the "Journal" recently, stress was laid upon the necessity for using coal crushed to a uniform small size, in order to obtain the highest quality of coke; and readers will, therefore, doubtless be interested in a machine which has been designed specially for this purpose. This is the Jeffrey rigid hammer crusher supplied by Messrs. Hugh Wood & Co., Ltd., No. 65, Fenchurch Street, London, E.C. 3.



A cross-section view of the crusher is reproduced; and the method of operation is as follows:

A central drum, to which manganese steel hammers are rigidly attached, revolves at a slow speed within the reduction chamber. The coal, on entering the crusher, is cracked against the breaker plate by the hammers, and then falls through grids arranged at suitable intervals round the bottom half of the machine. The method of operation is extremely simple; and test figures which have been obtained under actual working conditions show that the machine is exceptionally efficient in reducing large coal to a uniform product of small size.

The following screen analysis was obtained when reducing medium hard bituminous coal with a Jeffrey 24 in. by 20 in. crusher running at 325 R.P.M. and fitted with grids having ⅛ in. openings:

Through	½-in. mesh screen	92 p.ct.
,,	6 mesh screen	67 ,,
,,	10 mesh screen	47 ,,
,,	20 mesh screen	25 ,,

Under these conditions the capacity was approximately 13·5 tons per hour, and the average output of the driving motor 27 H.P.

A number of these crushers are being used by colliery companies in South Wales, Derbyshire, Northumberland and Durham, Yorkshire, and Scotland for crushing inferior coal to a size of ½ in. and under, so as to break away the dirt from the coal for washing purposes.

This crusher can be arranged to give a product of any size from ⅛ in. to 1 in., and there are three methods by means of which the size and grading of the product can be arranged to suit requirements.

1. By suitable arrangement of the openings between the grids.
2. By means of the adjustable breaker plate.
3. By the speed of operation, which may vary from 200 to 500 R.P.M.

Thus, if a particular class of coal is found to make the best coke when crushed so that (say) 85 p.ct. will pass a ½-in. mesh sieve, the Jeffrey rigid hammer crusher can, in a very short space of time, be arranged for this duty.

The hammers in these machines are of manganese steel, and have six corners, so that they can be used six times over. Thus the maximum life can be obtained from each set. The breaker bars are also of manganese steel, and can be used four times over. The bearings are of the self-aligning ring-oiling dynamo type, made in six pieces, so that the inner shells and babbitt-metal bushings can be cleaned and renewed without disturbing the shaft. The upper front half of the crusher is hinged, so that in a few minutes the whole of the interior of the machine can be opened-out for cleaning and renewals.

A breaking pin safety device similar to that used on the Jeffrey single roll crusher is fitted on the pulley, to prevent damage from large pieces of tramp iron, &c., which may enter the crusher. Any small foreign material not large enough to operate the breaking pin safety device can be ejected without causing heavy wear, by means of a device for opening the grids.

The crusher is built in several sizes, and promises to become as popular in the gas industry as the Jeffrey single roll crusher.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

[In a most interesting paper read at this meeting, Mr. P. E. Browne, of Brighton, gives his views on the principles which should act as a guide in placing a generous construction on the claims of the gas user, and at the same time in securing to the supplier a fair return on the capital invested. He deals comprehensively with the main and service obligations of the gas industry to-day, and compares the conditions of gas supply with those relating to electricity and water. By no means the least valuable feature of the paper is an outline of the "Universal Service Scheme" which was put into practice by the Brighton and Hove General Gas Company about two years ago, and has proved eminently satisfactory.]

A well-attended meeting of the Association, presided over by Mr. W. L. WESTBROOK, was held at the Westminster Technical Institute on Friday, Dec. 18.

The CHAIRMAN remarked that they were fortunate in having Mr. P. E. Browne, of Brighton, to address them. Members of the Association had lively recollections of Mr. Browne's paper read in January, 1923; and he was sure they had another treat in store that evening.

PREMISE AND PROMISE.

WITH A SPECIAL REFERENCE TO THE ALL-IN POLICY OF MAINTENANCE OF THE BRIGHTON GAS COMPANY.

By P. E. BROWNE, Distributing Engineer, Brighton and Hove General Gas Company.

You will remember no doubt that I had the privilege of addressing your Association in January, 1923, and that I then chose for my subject a recital of some of the things that constitute the principles and practice of gas distribution, embracing in the whole a fairly comprehensive résumé, though not exactly a minute study, of my own duties in the undertaking I have the honour to serve. When, therefore, your President of to-day informed me, on the occasion of his visit in February last to our recently-opened new Central Showrooms in Brighton, that he was the President-Elect of your Association, and asked me to make myself responsible for a further contribution to your proceedings, I was somewhat exercised in my mind as to my ability to prepare an address which might prove of interest and of some use.

You will, I think, go with me most of the way when I say that the distribution side of our business has had a great deal of attention focussed upon it of recent years, and that almost every conceivable phase of its activities has been discussed. This being so, it seemed to me permissible to ask you to mark time with me a little and take stock of our present position, and that we might venture to consider how we are interpreting our rights and duties, our privileges and obligations in the conduct of our business—the distribution of gas. What I shall endeavour to place before you is a representation of my views on the broad principles which should guide our attitude of mind in our determination to place a generous construction upon the claims of the gas user, and at the same time secure to the gas supplier a reasonable prospect of a fair return upon the capital invested in his business. To state the problem in other words: What are the premises or conditions that we must antecedently suppose or prove, what the stipulations we must make in our relations with our customers, and to what degree do these premises give promise or hope of success? So many and various propositions come before us from time to time that it is almost impossible, and certainly unwise, to lay down hard and fast rules of conduct; but at the same time there must be some defined basis of dealing, or else our methods would be prone to become haphazard, and we should be in danger of meting out unequal treatment as between customers.

Let us, first of all, reflect that a gas undertaking is governed by Statutes which give certain rights and enjoin certain obligations, and that, as the majority of the company-owned gas undertakings are what are termed "sliding-scale companies," Parliament protects gas users from undue exploitation in the selling price of gas, by decreeing that, within certain limits, the lower the price of gas the higher may be the dividend paid should it be earned. Thus, in effect, a gas undertaking embodies a perpetual partnership between the shareholder and the consumer or user. Now, I think that it is from this standpoint that we must view every problem that confronts us—namely, that our solution must be in the interest of both parties, the undertaking and the consumer; and when we consider our duties and obligations to the public we seek to serve, we must have in mind, also, our rights in return. In the first place, Parliament has given us a monopoly, which, being interpreted, means the exclusive right, privilege, or power of selling a given commodity or service in a certain market; and in return for this monopoly for gas Parliament imposes on us certain obligations. Now these obligations or duties are set out in a good many Acts of Parliament, both Private (those affecting a particular company) and General (those affecting the whole of the gas undertakings in the United Kingdom) and covering almost a century of time. The fact that the earliest of the Brighton Company's Private Acts, passed in 1839, is even to-day almost a complete *vade mecum* as to the rights and duties of the Company regarding the laying of mains and service pipes, speaks volumes, to the writer's mind, for the wisdom of Parliament and its procedure.

THE GAS COMPANIES' CHARTER.

The principal Act governing the supply of gas to the consumer is, however, a General Act applicable to the whole of the undertakings of the Kingdom, so that at all events this procedure is standardized throughout, as undoubtedly it should be. The Act I refer to is the Gas-Works Clauses Act of 1847, with its Amending Act of 1871, after which date there was no further general gas legislation until the passing of the Gas Regulation Act of 1920, which changed the basis of charge from volume to heat content, and brought, for a short time, a certain amount of abuse and distrust upon the new unit of measurement—the therm. The Act of 1847, or rather its Amending Act of 1871, sets out the terms upon which a company shall furnish a supply of gas to its customers; and, at the risk of wearying you, I will read its most important section—section 11—which really may be considered to constitute the gas companies' charter.

> "The undertakers shall upon being required so to do by the owner or occupier of any premises situate within 25 yards from any main of the undertakers or such other distance as may be prescribed give and continue to give a supply of gas for such premises under such pressure in the main as may be prescribed and they shall furnish and lay any pipe that may be necessary for such purpose subject to the conditions following, that is to say: The cost of so much of any pipe for the supply of gas, to any owner or occupier, that may be laid upon the property of such owner or in the possession of such occupier and of so much of any such pipe as may be laid for a greater distance than 30 ft. from any pipe of the undertakers although not on such property shall be defrayed by such owner or occupier.
>
> "Every owner or occupier of premises requiring a supply of gas shall serve a notice upon the undertakers at their office specifying the premises in respect of which such supply is required, and the day, not being an earlier day than a reasonable time after the date of the serving of such notice, upon which the supply is required to commence: Enter into a written contract with the undertakers, if required by them so to do, to continue to receive and pay for a supply of gas for a period of at least two years of such an amount that the rent payable for the same shall not be less than £20 per centum per annum on the outlay incurred by the undertakers in providing any pipe to be provided by them for the purpose of such supply, and give to the undertakers (if required by them so to do) security for the payment to them of all monies which may become due to them by such owner or occupier in respect of any pipe to be furnished by the undertakers and in respect of gas to be supplied by them.
>
> "Provided always that the undertakers may after they have given a supply of gas for any premises, by notice in writing, require the owner or occupier of such premises within seven days after the date of the serving of such notice to give to them security for the payment of all monies which may from time to time become due to them in respect of such supplies in case such owner or occupier has not already given such security, or in case any security has become invalid or is insufficient, and in case such owner or occupier fails to comply with the terms of such notice, the undertakers may if they please discontinue to supply gas for such premises as long as such failure continues."

MAIN AND SERVICE OBLIGATIONS TO-DAY.

Now, let us consider how this section 11 operates to-day in the light of modern conditions. We all realize that building development is taking place very quickly, and, as district salesmen, rejoice that it is the case; but at the same time, as gas providers, we cannot regard it altogether with unmixed feelings, as the developments are taking place, of necessity, in the more rural parts of our areas of supply. They entail, therefore, very large, or at any rate considerable, expenditure in providing the necessary main and service pipes.

You will notice that the section calls upon the undertakers to supply premises situate within 25 yards from any main that may be laid, or such other distance as may be prescribed—meaning, by inference, the prescription required under the Private Act of a particular company in its own area, if more favourable to the customer—which, in the case of the Brighton Company, reads 100 ft. in place of 25 yards. This clearly, therefore, does not make it incumbent upon any undertaking to extend its mains for any unreasonable distance at the request of any would-be consumer; and though before the war it was the general custom to extend mains at the behest of such would-be user, and free of any charge to him, conditions have now so much altered that we must carefully consider to-day the likelihood of the proposed mains becoming revenue-earning before we commit our undertakings to the necessary expenditure. Of course, supply propositions vary very considerably; in some cases, the estate to be developed may consist of a large number of houses, and the owners may wish to employ gas for the full domestic purposes—lighting, heating, cooking, and hot water—whereas, in other cases, the demand may be for a considerable extension to supply one or two detached residences lying at a considerable distance from the public highway, and where the

requirement of gas may be solely for cooking. Therefore I think we may fairly contend that each case should be dealt with on its merits as we understand them. For example, since the war my Company laid about 6 miles of main, at their own cost, to supply a settlement of some five or six hundred bungalows; and this was done because we thought there was reasonable hope of a good return on the necessary capital, more especially as we were first in the field and had every prospect of obtaining the custom for all domestic uses. That this course of action was justified, has been proved by the fact that we have obtained nearly the whole of these bungalow residents as our customers; a great number of them using our service entirely, and all of them for lighting and cooking at any rate. We have, on the other hand, estates developing, where for lighting electricity is very popular and preferred to gas, and we have felt that we were not justified in undertaking the whole of the cost of supplying these estates with mains; but at the same time, being anxious to extend our business and to obtain some share of the domestic fuel requirements, we have offered to bear that proportion of the cost which represented our whole pre-war outlay, charging the difference between this and our post-war cost to the customer. Our experience has been that in most cases this is an acceptable proposition to estate developers, and, if understood at the commencement of the development, does not seriously weigh upon the estate owners, as they are enabled to charge this difference to the purchasers of their land according to the frontage of the plot purchased. After all, the price asked for the ground must take into consideration the cost of making the roads, forming the sewers, paving, kerbing, channelling, and street lighting; so why should it not also include the provision of gas? You may depend upon it that, so long as gas companies are content to lay mains at the request of estate owners and free of any expense to them, they may continue to do so with impunity; but our experience has been that, though at first it may be difficult to impress upon such owners the fairness of the proposition already enunciated, yet ultimately they see the justice of our claims. I think I may say that we have in very few instances failed to come to terms. It is, undoubtedly, realized by all estate developers that gas will be as much required by the prospective plot-holder as water, for few housewives are content in these enlightened times to suffer the inconvenience and drudgery of the coal range.

Now with regard to service pipes. Section 11 calls upon the undertaking to lay, free of charge, so much of the service pipe as shall be on the public highway, not exceeding 30 ft., and requires the owner or occupier of the premises to pay the cost of so much of the pipe as may be laid upon the highway for a greater distance than 30 ft., and for the whole of the pipe upon his property. Whereas before the war we were content in most cases to lay service pipes free of charge from the main to the meter position, if the distance were reasonable, to-day we abide faithfully by the requirement of the Act, and our customers are quite satisfied. It will be appreciated that the provision of a service pipe of a size definitely determined upon in the light of the requirement of the householder, and efficiently laid from the Company's main, is a *sine qua non* of after-satisfaction in use; and in this connection the Company took powers in a Private Act of 1910 to specify the size and material of the pipes which are to be laid by the consumer—that is, on his own property—either in the first instance of service, or on the occasion of any renewal between the Company's mains and the meter, having regard to the probable maximum consumption of gas to be used at any one time. I would like to say that we have gone a little further than this, and in our case, by arrangement with the builder, we lay the whole length of the service pipe from the main to the meter position, in preference to connecting up to service pipes "laid through" by the builder, a custom that obtained for many years in our area. We in all cases assume responsibility for the perpetual maintenance of the pipe, and its ultimate renewal if necessary, and naturally wish to be assured that it is properly laid at the outset.

The Act referred to has also given us powers to insist that the meter shall be placed as near as reasonably practicable to the Company's main, but within the outside wall of the consumer's premises; and here I would like to say that we are very careful, nowadays, in the selection of the site for the meter, in order to ensure, as far as possible, that in the event of any untoward happening or emergency the supply of gas to the premises may be entirely shut off. If, for instance, the consumer wishes the meter placed in the cupboard usually formed under the stairs leading from the hall to the upper floors, this may entail the laying of a length of pipe from the front door—called by us a "lane" pipe—and conveying unregistered gas at the main pressure into the premises. Now, in the event of fire, this might add to the conflagration, so that we insist on a boundary cock being placed at the front door, and a suitable trap being cut in the floorboards for it. Preferably, of course, we seek to place the meter directly on an outside wall, with the tap immediately available for use; but this is not always in accord with the ideas of the owner or architect.

CONDITIONS OF GAS SUPPLY COMPARED WITH ELECTRICITY AND WATER.

While on the subject of mains and services, I will just refer to an argument sometimes advanced by our customers in their endeavour to persuade us to lay pipes free of cost. We are told that our electrical friends do this, while the Water Authorities who supply our area also do so, if the revenue to be obtained is equivalent to 15 p.ct. on the outlay, failing which they require payment of the cost, or rather the deposit of the estimated cost, until such time as the rate shall produce 15 p.ct. on the outlay. Now if we examine this argument, it will neither bear the light of day, nor yet hold water. In the first case, the electricity supply is in the hands of the Municipalities in the two parishes of Brighton and Hove, forming the greater part of our area; and they are therefore trading as Trustees of the ratepayers and with the ratepayers' money, so that, in the event of a loss accruing, it will be borne by the whole body of ratepayers. In the case of the water, a return is secured by the very fact that the water charge is based upon the rateable value of the premises. Now in our case, as opposed to that of electricity, we have not the backing of the rates behind us, and we are entrusted with shareholders' money to invest to the best of our ability and wisdom, and we must refrain from spending it if we cannot be reasonably assured that it will be dividend earning.

Gas supply, again, differs fundamentally from water supply, in that, even if a service of gas is taken to a premises, there is no compulsion upon the user to consume any specific quantity, and he may, conceivably, require such a small amount that the profit derived therefrom would not pay the interest on his particular service, let alone leave any provision for maintenance and repair. We are shortly to experience competition from private electrical ownership in the more westerly part of our area, and it will be interesting to learn how far the new Company will be prepared to go in the matter of mains and services free of cost to the customers. I believe we shall find that it will not be able to offer better terms than we ourselves can, and for precisely similar reasons.

HOUSING SCHEMES.

Our treatment of municipal housing schemes is on a somewhat different basis, but here again we are guided by the particular circumstances of the case. In those cases in which a Corporation is only agreeable to giving us the cooking load, we offer to lay the mains free of cost, but arrange with them that they shall bear the whole cost of the services from the mains and the fixing of the control cocks on the service pipes, and the cost of the inlet connections to the meters. Where, however, we are given the lighting in addition to the cooking, we agree to extend the main at our own cost, and render the Corporation a supply to the houses under the terms of section 11, previously quoted, as regards the service pipes. You will, perhaps, remark that the cooking load forms the larger portion of the sale to this particular type of premises, and I agree that it is so; but we do not regard it as being the most important now, because it synchronizes with our peak load, and the increase in the dinner-time demand taxes our manufacturing and distributing resources out of proportion to our lighting load. The latter, therefore, is the load we are seeking to maintain, and develop as far as possible, so as to equalize our output over the hours of natural and artificial light.

This, then, is our interpretation of this section of the 1871 Act, and I hope I have convinced you that we have interpreted its meaning correctly, and have tried to hold the scales fairly as between Company and customer.

RIGHTS AND FACILITIES OF THE CONSUMER.

Now let us consider for a moment that we have complied with our statutory requirements and brought our gas service pipe into the premises of the would-be user, and have provided a meter on hire to him as required by the Act. At this point our compulsion ceases, and every other thing necessary to the actual use and enjoyment of the gas remains to be furnished by the user, if we elect to compel him to do so. The contrary, however, is the case. From time to time we have sought powers to do certain acts to ease the consumer's burden, with the present-day result, as you are well aware, that the consumer by ordinary meter may hire from the undertaking gas cooking stoves, heating stoves of every description, hot-water boilers and circulators, &c.; the smaller consumer of the less well-to-do class may hire (in our case) complete arterial piping and fittings at a weekly rental; while the artisan may enjoy the complete fulfilment of his gas needs without separate charge of any kind, the hire charge being arranged for in the setting of the range of the meter, through the agency of which he purchases gas, with the aid of the modest penny.

We are empowered to do all these things under the Act of 1910 previously referred to, which gives wider powers in these directions than earlier Private and General Acts; and provision has also been made to protect the Company's property in order that it shall not be subject to distress, or to the landlord's remedy for rent, or be liable to be taken in execution under process of any Court or proceedings in bankruptcy against a person, whosoever the tenant may be, provided that such fittings are marked or impressed with a sufficient mark or brand indicating the Company as the actual owner thereof. Of course, we take good care that this is the case, with the result that we experience very little trouble in this direction, though it does occur, sometimes, that the Company's property is offered for disposal by an auctioneer when cataloguing for sale the contents of a property. We recognize that this is done in good faith, in the belief that it is the property of the vendor; and, upon re-

ceiving a notification to the contrary from the Company, should it come to their knowledge, the property is always withdrawn from the sale or, if previously disposed of, paid for by the auctioneer.

Now we come to the facilities offered to the customer to hire gas-consuming apparatus of all descriptions, a policy which, undoubtedly, is to his gain, in that improvements effected from time to time enable him to take advantage of alterations in design, and the production of more economical apparatus, by returning the appliance already hired and replacing it with the more up-to-date pattern at no sacrifice to his pocket—a point which is sometimes overlooked when consumers feel disposed to complain of the rental terms asked by the Company. After all, very large sums of capital are expended in these appliances, and it is only fair that a due and appropriate rental rate should be fixed for their use by our customers, although I am of opinion that these rents should be kept as low as is consistent with sound finance. A point often alluded to by a customer, when placing an order for certain apparatus, is his inability to see the justice of charging for laying the supplies and fixing gas-consuming appliances; his contention being that, as they are loaned to extend the Company's business by the consumption of gas, all fixing should be done free of cost to the customer. Now this, in my judgment, is obviously unfair, as ultimately the cost of such services would have to be borne by the whole bulk of consumers in the price of gas, thereby penalizing both those who elect to purchase their own appliances from other sources, and those who have not yet realized the necessity for these domestic aids. Before the war, our practice in Brighton was to lay supplies to cooking stoves, and fix them free of charge if within 20 ft. of a suitable-sized pipe; and similarly heating stoves, hot-water circulators, and apparatus of like nature if within 15 ft. Since the war we have completely altered this arrangement, and now charge for the services rendered. Our experience, in this regard, has been that although this may have lost us some orders, yet it has not robbed us of any productive business, because, whereas before the war people were inclined to have appliances installed liberally (even where no great use was intended) as they were only committed to pay the hire rate, now we may be reasonably assured that when an appliance is ordered it is to fill a real need, and will be brought into regular service. That our procedure is the correct one, I feel confident, because the number of returned stoves—heating in the summer, or cooking in the winter, as the case may be—is nothing like so great as we experienced in past days, having regard to the largely increased number installed.

Duties to the Public—Representation.

So much for the principles that guide us in our dealings with the public. Next, let us briefly consider how we conceive our duties to the public. First of all, I think, we must ever bear in the forefront of our minds the fact that we are out to give service. The interpretation of this that we are trying to live up to in Brighton is, that when we supply gas it is not sufficient to deliver it to the inlet of the meter and leave its use to take care of itself; we must add to this the determination to go further, doing our best to ensure the fullest and yet most economical use of gas, at one and the same time, by the consumer. That this embraces a good deal, and entails a large amount of supervision of appliances when once installed in the consumer's premises, will be understood; and it is of this that I am going to say something later, when referring to our recent departure known as our "Universal Service Department." Before coming to this, however, there are one or two other things that go to make up the whole of "the conditions antecedently supposed or proved," and in this connection I am thinking of the Company's representation.

It will be granted at once, I think, that this is a very big proposition with an undertaking of the nature of a gas company. The very character of its business, with, in the ideal state, every householder a customer for many and diverse requirements, demands that it be transacted outside the offices of the company and inside the premises of the customer, whether home, office, or factory. The first consideration, therefore, must be that our representatives create the right atmosphere when dealing with the customer, who forms his estimate of the company upon the bearing of the employee with whom he is brought into contact in his business transactions. It is not sufficient, alone, to have an expert knowledge of one's business. It is necessary, beyond this, to be able to see the consumer's point of view, and endeavour always to meet it, so long as the company's position is not prejudiced thereby. I think gas companies may with truth claim that they are served, in the main, by employees typifying this desideratum; and you will bear me out when I say that this is a highly important matter, the personal element—as I presume you will agree with me that there is no more satisfactory business transaction than one in which mutual trust is engendered between a particular representative and his customer. How many times in the course of a year do we receive letters asking that a particular representative may be sent on some errand or other, showing us that he has impressed his personality on the customer, and thereby cemented friendship between the company he serves and that customer?

There is another form of representation that is highly important. I allude to the material as opposed to the personal—namely, the showroom. Showrooms are undoubtedly necessary adjuncts to our business, as it behoves us to afford every facility for the display to intending customers of suitable appliances for the consumption of the gas we have to sell. I do not presume, for one moment, that you do not all realize the necessity for showrooms; but I do ask you to remember that the impression created upon the consumer is of the highest importance, and therefore that we should always endeavour to keep our showrooms spick-and-span, and fitted out with due regard to the proper display of our appliances. We should realize that an overcrowded showroom is apt to savour of a jumble sale, while a well-furnished reception room, equipped with modern appliances properly fixed and able to be demonstrated, creates that favourable first impression which, subconsciously no doubt, but actually, is remembered to the credit of the undertaking in the consumer's after-transactions. It is needless to say, of course, that the *personnel* of the showroom staff must be carefully chosen and must be imbued with the spirit of service. Courtesy and the capacity for taking pains usually bring their due reward in the shape of orders, while neglect of detail or offhandedness may easily alienate intending customers and direct their business into other channels.

I will not weary you with the question of organization of the various staffs necessary to the running of our business, as these are matters for the discretion of the management of each individual undertaking according to its needs; but I think it of the highest importance that we should inculcate in every employee, whatever his rank, the necessity for never-varying courtesy towards the customer.

The Promise—Confidence of the Public.

So much then for what I have termed "premise." Now, if we practise those things that I have set out, to what promise or hope of success may we reasonably look forward? First of all, I think that we shall go a long way towards obtaining the confidence of the public, without which the stability of our business can never be assured. If we are ever careful to conduct our business on efficient lines, and do not promise more than we can perform, and are always scrupulously truthful when comparing the values of gas, for any particular purpose, with those of other illuminants and fuels, in our endeavour to persuade the man in the street to shop with us, we shall be on the high road to that material prosperity which, all things being equal, will naturally ensue.

You will note that I said "all things being equal." It is not to be supposed, for one moment, that the public will continue shopping with us if other more satisfactory and more economic means of performing those services, which we now furnish, are found; but of this we need have no fear if we keep abreast of the times and have faith in our business. Although it must be conceded that we have very serious competition in our lighting field, there are vast untapped possibilities for gas as a domestic and industrial fuel. We are hardly on the fringe of our domestic warming problem—this though our output of gas fires each season astonishes us, and we are naturally possessed of proper pride at their ever-increasing popularity. When we consider the enormous potentialities of gas fires in each and every one of our areas (seeing that most of us have a long way yet to go before we can boast of an average of one fire hired per consumer, taking all classes into consideration), we need, I think, have little fear for the future; and this is only one outlet. There yet remain many kitchens in which solid fuel is still used for cooking, while the gas furnishing of the household domestic hot-water requirement is so far scarcely touched. Perhaps in this latter fact lies the reason for the retention of the coal grate in the kitchen, with its "boot" boiler and circulatory system; and it must be conceded, I think, that though gas-fired circulating boilers or geysers respectively have undoubtedly met the needs of the tenants of smaller residences and flats, gas at its present price is still too expensive to employ for furnishing the constant hot-water demand experienced in larger properties. It must not be forgotten, however, that this hindrance (shall I say?) should not deter us from seeking to abolish, once and for all, the coal kitchener, as we have coke, our solid fuel, for disposal, and there are many types of circulators now marketed which are highly economical to run with this fuel.

I think, however, we may fairly claim that gas cooking is now a settled practice in the very large proportion of domestic households within range of a gas supply main. I have been much struck of recent years by the growth of outright sales of high-grade gas cooking stoves, as an alternative to hire of the ordinary types offered by the undertaking; and as long as we can exercise a beneficent supervision of their performances in use, I think this is all to the good. The customer's ownership certainly tends to their permanence of retention, and ensures—rather naturally, I suppose—the bestowal of more care upon them in use, and the taking of greater pride in their cleanliness, which is one of the greatest essentials to satisfaction in service.

A very pleasing feature of more recent times is the large influx of custom from hotels, large boarding houses, restaurants, hospitals, and like institutions, showing us that gas is making a very real appeal in kitchens where cleanliness and service to the minute are things of the first importance. We may be sure that the "ready on tap" service, coupled with the knowledge

that the fuel is almost unvarying in quality (a question of paramount importance in institutions of this nature), is of the greatest help and value to those charged with the preparation of food to time. This time factor is so important that I think it a reason—more perhaps than any other, including the cost factor—that will militate against the use of electricity for cooking in large establishments.

Before coming to the maintenance side of our business, I would like to impress upon my hearers what a great asset we possess in the reliability of our supply. At the back of every gas service is the reservoir formed by the district supply mains; and behind these again, the storage capacity of the gasholders. Reliance upon electricity, on the other hand, involves a great risk of " doing without " at awkward junctures, owing to the chance of failure. Such failure has frequently occurred in the past, does occur from time to time, and always may occur, owing to electricity's inherent weakness—its inability to be stored.

I think I have said sufficient to indicate that we have every reason to look forward to continued prosperity in our business, if we learn to visualize our aims and obligations, our duties and privileges, in the right perspective. And now, with your permission, I will give you a brief description of our " Universal Service " system.

UNIVERSAL SERVICE.

The institution of what we in Brighton have called our Universal Service Scheme was not the result of a hastily conceived decision, nor yet was it due to panic legislation. Rather, we think, it was the natural development of ideas, in our interpretation of the fuller meaning of service to the consumer. The scheme has been shaping in our minds for some years past, but it was only about two years ago that circumstances became favourable for its introduction.

Shortcomings of Partial Maintenance.

Like most other companies, we have long had a burner maintenance scheme in operation, but we realized that this fell short of accomplishing our desire to have the supervision of all the gas lighting appliances in our area of supply. It must be remembered that under such a scheme, if it were contributory, it was left to the consumer's judgment, and in a measure to his ability or desire to pay for service, to decide whether or not his lighting appliances should be kept in a state of efficiency, with the somewhat natural consequence that comparatively few users of gas for lighting availed themselves of the maintenance service by becoming subscribers to this scheme.

Originally we asked ½d. per burner per visit (increased to ¾d. later by reason of war conditions) as a contribution to the labour cost; all materials being charged to the consumer, either at the time of the actual performance of the work or on a bill rendered with the gas account at the end of each quarter. These arrangements led to a certain amount of difficulty in accounting and collection, more especially as the items involved, relatively small in themselves, were apt to be overlooked by the customer, and often became a subject of dispute at the time of paying his bill. These difficulties, of course, were not insuperable, and the real underlying principle at stake resolved itself into how far this maintenance scheme was fulfilling its purpose. After careful consideration and scrutiny, we came to the conclusion that it fell lamentably short of the ideal—that is to say, although we had a highly trained maintenance staff rendering service to certain of our customers, yet these services were rendered to such a small percentage of gas users that the Department really proved ineffective when considered in its relationship to the great bulk of customers, while at the same time it was a charge upon the organization. Year by year our lighting installations have grown, although it must be admitted that we are experiencing considerable competition from electric lighting, and in addition to these lighting installations many thousands more cookers and fires have been, and are being, installed; and the same feeling remained uppermost in the minds of those charged with the responsibility of placing apparatus in the customers' houses—that when once installed they had hitherto been left very much to their own sweet devices as to performance. Now we have come to the conclusion that this state of affairs does not contribute to satisfaction in use, either from the customers' or the Company's point of view, and that it ultimately must react on the Company if the appliances are allowed to get into disrepair and consequent inefficiency.

For some years now this Company has made a feature of the regular inspection and maintenance of all gas-heated steam radiators, circulating boilers, and geysers, and of late years, in addition to this, we have had a special staff of stove cleaners whose duty has been to clean stoves *in situ* in the consumers' houses; our practice being to agree to clean thoroughly and renovate the whole of the interiors and burners, free of charge, after a three years' period of hiring, if requested so to do. In addition to this, we have recently placed a large quantity of fires, on hire, in hotels and boarding houses in the town; and, realizing that they would probably prove, if kept in proper condition, a not inconsiderable advertising medium, we decided to inspect these regularly at the beginning of each season, a course which has been followed to the great advantage of the Company and satisfaction of the consumer, at an average cost for labour and material expended of 1s. per fire. Thus it will be seen that really we have had the nucleus of a comprehensive scheme of maintenance in being for some years past, so that it was not altogether breaking new ground to institute universal service. The first problem that we had to face was upon what basis we should commence operations, and what the ultimate probable cost of such a service would be.

Launching the Service Ship.

Well, we duly made a start and reduced our problem to practical politics, and we are now beginning to foresee the ultimate cost of the scheme. Although it is not yet sufficiently grown for us to speak with definite knowledge, we can now look ahead and feel that we should be able to give our consumers a very live service at a cost not exceeding 0·2d. per therm. Now as to the steps we actually took to draw up and ultimately launch the campaign. It will be remembered that we had in being a burner maintenance staff (comprising 1 foreman and 14 skilled fitters) to minister to the wants of our customers who subscribed for maintenance. Here then we had men already trained, with the knowledge of the average run of lighting fittings obtaining in our area of supply, in touch with the geography of the district, and able to differentiate between the needs of the varying elements in the district, so that we thought that these men should prove capable chargehands for the staff about to be formed and trained. As regards that staff, its actual personnel, we realized, would be of somewhat large proportions to cover our roster of 55,000 consumers; and as, in the main, the staff to be employed would be charged with the maintenance of lighting fittings, and simple adjustments to cooking and heating stoves, it was recognized that it would be uneconomical to put fully-grown men, at men's wages, on this particular work. It would be just as well, and perhaps better, performed, in our opinion, by specially-trained youths (their minds being naturally more receptive and therefore more easily directed) who had had some previous training as fitters' mates. So we proceeded to select the first batch of one dozen youths of 17 years of age, who came into this category. They were given a three months' course of training, consisting of one month each in the burner maintenance shop, the brass shop, and the cooking and heating stove shop, at the end of which period—that is, in the 13th week—they were given a refresher course for the first three days in the week, followed by a practical examination in each of the subjects, and concluding with a written paper covering the whole of the ground. This procedure has been followed with subsequent squads of trainees with very gratifying results.

Equipping and Working the Scheme.

They were then fitted out with kit and uniform hats, and addressed by myself on the aims and objects of the Department, and urged to keep to the straight and narrow path, stress being laid upon the fact that they were not to consider the job a " blind alley " one, but a training ground for better things—*i.e.*, the ultimate purpose to be, after tuition, their advancement to positions as first-class fitters in the Company's service. We have now provisionally set the time-limit for service in this Department at 5 years, after which we propose to re-transfer the youths (who will be then young men of about 22 years of age) to the district for a period of about six months with a skilled fitter, with the object of then giving them the fitter's tools, if they merit them. Thus, the Universal Service Department will fulfil a useful purpose as a training ground from which to draw fitters for our service to fill the gaps left by men who, in the natural course of things, must fall out through the passage of time.

The kit provided comprises:

(1) *Maintenance Valise.*—Specially designed and constructed to carry the maximum material likely to be required during a day's visits, together with the necessary tools as undernoted:

9 No. 4 or universal mantles.	6 4001 by-pass nibs.
3 Graetzin mantles	24 C. rods.
3 No. 6 or medium mantles.	6 pieces " Thermo XX " radiants.
3 No. 2 Sugg mantles.	1 wire brush.
3 No. 5 or bijou mantles.	1 " Goford " flint lighter.
6 " C " upright mantles.	1 6-in safe edge file.
3 6-in. glass chimneys.	1 6-in. pliers.
3 " Regent " by-pass nibs.	1 6-in. screw-driver.
3 C. gauzes.	1 6-in. footprints.
3 C. air-controller bands.	1 combination burner tap set.
3 No. 4 " Nico " by-pass tubes and nibs.	1 bradawl.
	2 dusters.
3 C. by-pass burner gauzes.	1 chamois leather.
6 No. 2 Sugg gauzes.	1 oily rag.

The weight of the valise, fully loaded, is only 14 lbs.—much lighter than that originally used by our maintenance staff—but we think it, and find it, sufficiently comprehensively stocked for its purpose, and of such a weight as not seriously to incommode the lads through the course of a long day.

(2) *Number Badge.*—Nickel plated on white metal for ease of identification both by the Company and the customer.

(3) *Identity Card in Case.*—For production in the event of difficulty in obtaining admission to premises.

(4) *Cash Receipt Book.*—In duplicate, one left in the office for examination and the other carried for use. These books are used on alternate days.

(5) *Inspection Card Wallet.*—With inspection cards for the day's work.

(6) *Materials Requisition Book.*

The lads come to the fitters' depôt each morning at 8 o'clock, and clock on, just as the remainder of our working staff; and we are thus assured that they keep good time, while this venue is fairly central for all districts. They then pick up their valises and card wallets, which they have recharged on the previous evening. The lads have been districted under their charge-hands or foremen, and report to their particular foreman each day before proceeding to their jobs. He then meets them once during the day, when any difficulties are elucidated, and, if necessary, he will accompany a lad to assist or advise in case of special need. The lads report to the depôt at 5.30 each evening, and hand-in the day's completed cards for checking and filing, entering any special complaints received for attention next day by the appropriate staff, and replacing used material from the valise to bring it up to strength again. The district foremen examine the day's cards, and select certain of them for check calls, in order to discover if the consumer is satisfied with the service rendered, and if the material booked to the particular job has been used.

It will be realized that there is a considerable amount of office work in connection with the scheme, in the checking of the cards against the receipt books and cash received, debiting the accounts of those credit customers who elect to pay on the gas bill, the filing of the cards in proper rotation so that they come up for revision at the appropriate time, and, of course, the districting of the following day's cards. The supervising foreman spends his time between the office and district, and naturally holds a roving commission.

Results and Costs.

Now a word or two as to what we have so far accomplished. We have a class of six youths now in training, and shortly to be placed on the district; and they will bring our complement up to fifty-five inclusive of charge hands, and we anticipate that this number will enable us completely to cover our area for all classes of custom, more especially as we are now getting some idea of the average time taken per job—enabling us, therefore, to staff a particular district sufficiently, but not wastefully, in order to regularize the periodicity of calls at four visits per annum for ordinary households, with special provision for schools, churches, shops, and outside lamps as may be necessary. We have now had an opportunity to analyze our working of the Department for the period that it has been running, or at least from Jan. 1, 1924, our commencing date, to Oct. 31, 1925, and our records for these twenty-two months of working are:

1.	Number of visits	135,593
2.	,, ,, burners inspected	688,125
3.	Cooking stoves inspected	28,061
4.	Fires and radiators inspected	9,788
5.	Other appliances inspected	798
6.	Cost to Company of maintenance materials sold	£1,548
	Charged to consumers at	£1,947
7.	Percentage of (6) collected as cash at time of visit	46·75
8.	Total wages paid	£6,305
9.	Total cost of wages including overhead charges (supervision and office expense)	£7,465

It may be of interest to record that the cost of outfit, inclusive of uniform cap, number badge, identification card, inspection card case, and valise, amounts to 39s. for each attendant, and that the actual cost of the thirteen weeks' training (without, of course, reckoning the wages of the instructors) amounts to just under £10 per head, so that the Company expends, in all, £12 on each lad before placing him on the district.

There is a last point I would refer to, and this is one that perhaps will strike a sympathetic chord. No doubt you have all experienced the difficulty of coping with orders and keeping customers appeased at the rush periods. In our case, these periods are always with us at quarterly meter-reading times, probably on account of the migratory nature of boarding and apartment house proprietors. It has been our custom somewhat to deplete our fitting staff at these times, to give a helping hand, with service complaints, to the meter inspectors, thus enabling them to concentrate on meter reading in order to get through their task in the allotted period; and it has been a recurring source of anxiety to the contracting side of our business. We are now training up our Universal Service Staff to take over this duty from the fitters, and are hoping that, by this arrangement, we shall not only add to their usefulness, but shall be better placed to render earlier attention to customers' orders at these times of pressure.

Discussion.

The CHAIRMAN, having expressed his appreciation of Mr. Browne's able paper, asked whether the author had ever exercised the powers of a full 20 p.ct. on the capital expenditure on mains. He had been impressed by the fact that, at Brighton, additional main cocks were fitted to every service. Was there any provision for a periodical examination of the cocks? If not, he queried the justification of the expenditure on them. Mr. Westbrook said that he must congratulate the author on his figures relating to the maintenance scheme. He (the speaker) was surprised to note the low figure for the material sold—which worked out at 3¼d. per consumer. As yet the North Middlesex Gas Company were only touching the fringe of the problem; and their figure was about 11d. per consumer. Perhaps this was due in large measure to the fact that the labour charges were greater than at Brighton. Boys with three or four years' experience were employed, who received 7d. or 8d. per hour. These lads undertook the whole of the complaints as well. Regarding the question of complaints, had Mr. Browne found that his system had occasioned much more work for the complaints staff?

Mr. BROWNE replied that on certain occasions they demanded a guarantee on the capital expended on new mains, but they did not abide by the statutory requirement, and insist on the 20 p.ct. Usually 8 p.ct. per annum was charged for a period of ten years. This was not regarded as a guarantee on the cost of the mains, which remained the property of the Gas Company. Of the 8 p.ct., 5 p.ct. was regarded as being interest on the capital expended, and the balance met maintenance costs. At Brighton they always provided a main cock on the service, and also a boundary cock at the front door. These were regularly inspected. Mr. Browne said he was very glad to hear that a maintenance scheme had been adopted by the North Middlesex Company. To his mind, this was the only possible method of cementing their relationship with consumers. Such a scheme was a protection of mutual interests—those of the user and the supplier of gas. The figure of 3¼d. per consumer, for material sold, had been mentioned by Mr. Westbrook. At Brighton the maintenance staff did not sell appliances; and this fact probably accounted for the low figure. Of course, the material used was reduced to the lowest possible minimum. Also, the cost per consumer at North Middlesex no doubt—as suggested by Mr. Westbrook—was greater because of higher rates for labour. Whereas this Company paid 7d. per hour, at Brighton the commencing rate for the boys was 4½d. per hour. This rate increased as the lads progressed; and by the fifth year it was about 10d. per hour. Regarding complaints, the scheme in operation at Brighton brought the Company into closer touch with consumers, and many "complaints" were only for minor adjustments—certainly they were not as a result of the lads' own work. Their lads did not create complaints; they found them.

Mr. J. R. GALE (North Middlesex) asked if Mr. Browne put a property badge on hire-purchase apparatus; and, if he did so, why? The badge had to be taken off eventually; and it did not seem to him to constitute a safeguard. With reference to the cost of maintenance, this appeared to be 1s. 1d. per visit, which was most satisfactory. He was in entire agreement with the author as to the method of charging the customer for the laying of service pipes.

Mr. BROWNE said he was diametrically opposed to Mr. Gale on the question of badges on hire-purchase appliances. The badging of apparatus constituted a strong argument if the consumer failed to pay his instalments. He was glad that Mr. Gale agreed with the system of service charges. If services were given free, they were too often undervalued; and it must also be borne in mind that as the capital charges of an undertaking, per million c.ft. of gas sold, increased, it became more difficult to supply cheap gas and pay reasonable dividends. The *raison d'être* of new services must be increased business. New work should be undertaken on a sound financial basis.

Mr. F. HOLLAND (North Middlesex) inquired whether the 1s. 1d. per visit mentioned as the cost of the Brighton maintenance scheme included such parts of appliances as new drip tins, taps, &c.

Mr. BROWNE said it did not.

Mr. G. WINSLOW (Gas Light and Coke Company) added his thanks to the author for his paper. It was an excellent thing to have their memories refreshed on the subject of their duties and responsibilities regarding gas supply. He had been interested in Mr. Browne's treatment of municipal housing schemes. In one case in his (the speaker's) area of supply, the local council refused to pay 8 p.ct. on the cost of the mains; and as a result there was now no gas in 200 houses. The tenants in these houses were continually asking their Company for a supply of gas. As regards boundary cocks, he asked Mr. Browne how long these had been in vogue. The author had stated that his Company laid 30 ft. of service free, and his remarks on this subject suggested that the builder had a right to lay the remainder. His (the speaker's) Company did not allow the builders to put down services; and he wondered whether the builder could force his rights. Mr. Browne had also mentioned the competition of private electricity companies. It was refreshing to meet this type of competition, instead of that of rate-aided electric supply. He asked the author's opinion of white-enamelled exteriors for cookers. He noted that these were not generally in use for simple hire. Undoubtedly universal maintenance should be undertaken by every gas undertaking. The crux of the problem was, of course, to see that they got actual value for the money expended in this direction. He took it that Mr. Browne had satisfied himself that this was the case at Brighton.

Mr. BROWNE, speaking of main laying in new municipal estates, agreed that it was difficult to persuade some corporations to provide 8 p.ct. of the capital outlay. However, the tenants would demand the gas, and eventually the corporation would have to accede to their requests. Mr. Browne said that he had for some time been in discussion with a rural council on this very point. After many refusals, the council had invited him to attend a meeting, and had followed his views. They had applied to the Ministry of Health for permission to pay the costs out of the repairs account. The artizan's light was undoubtedly gas. The Brighton Corporation, though they owned an electricity undertaking, realized this, and realized also that it was only fair that the Gas Company should have a reasonable return on their outlay.

Mr. WINSLOW asked Mr. Browne whether the Ministry of Health

would allow a local council to wire a housing scheme, and also contribute towards the cost of a gas supply.

Mr. BROWNE said they would. On the question of boundary cocks, he remarked that these had been in use in Brighton for many years. The Company now urged that they should be fitted in every case. Every new service was now viewed from the office. Formerly it was the custom to send a service layer to do the work, without instructions on how it should be done. All this was now changed; and he was now informed of the manner in which he should do the job. Regarding builders' rights, a gas undertaking had no rights outside their own boundary; and consequently a builder could, if he demanded, lay his own services. But at Brighton, at any rate, the builders were reasonable men, and were willing to be persuaded for their own good. The Company laid the entire service. Otherwise, how were they to know whether the pipes were efficient and sufficient? As to electrical competition, that of municipalities was rate-aided. Occasionally at Brighton customers said that unless certain concessions were made to them they would change to electricity; but the Gas Company were not afraid of competition, and in no case departed from their customary practice. Mr. Winslow had spoken of white-enamelled exteriors for cookers. The reason why these were not used for hire cookers was simple. If they were used, what was going to happen to those hire cookers without them, which were already on the district? At Brighton they were busy modernizing their hire cookers by fitting new hotplates, on which, after all, 75 p.ct. of the work was done. It would probably take ten years or so to complete the work, but they felt convinced that it was well worth doing. Mr. Winslow had also asked whether he thought the money expended on the maintenance scheme brought an adequate return. He felt sure it did. Of course, it was foolish to suggest that they obtained 100 p.ct. efficiency from youngsters; but there were supervising foremen, and in his opinion the services of the lads was of marked value. At any rate, since the launching of the universal service department, countless letters had been received from consumers, as a result of which many old fittings had been replaced, and much good work done.

Mr. A. BROADBENT (Gas Light and Coke Company) agreed with other speakers as to the benefits of a universal maintenance scheme, and remarked on the low figure of 1s. 1d. per visit which obtained at Brighton. Mr. Browne had put the cost at 0·2d. per therm. Was this included in the price charged for gas? Also, was the consumer called upon to pay for the boundary cock?

Mr. BROWNE said that when the scheme was inaugurated the Company had just legislated for the price of gas; and at the moment the 0·2d. was borne by the Company. The consumer paid for the boundary cock.

Mr. LEONARD LACEY (Gas Light and Coke Company) remarked that Mr. Browne's description of the universal service scheme was most interesting. He would like to ask the author what class of boy was employed on the work, and how the lads were recruited. Did they attend evening classes?

Mr. BROWNE said that a remarkably good class of boy was recruited for the work. They had to furnish a good school reference. Brighton, of course, was not an industrial town, and consequently the boys there were anxious to obtain decent employment. As a matter of fact, the Company were inundated with applications for the job. The youths were encouraged to attend evening classes two nights a week, and the Company paid their fees. Two of the chief foremen of the Company were on the technical staff of the Brighton Municipal Technical College, and they trained the lads, in addition to a permanent instructor retained by the College. The Company offered prizes to successful students in their employ; and the results of examinations were carefully studied.

On the proposition of Mr. BROADBENT, seconded by Mr. A. W. CULLINGTON, of Woking, a vote of thanks was passed to Mr. Browne for his paper.

Mr. BROWNE's reply terminated the meeting.

Pulverized Fuel Firing.

Writing in the November issue of "Fuel in Science and Practice," W. R. Chapman says that it would sometimes be economical to convert mechanically-stoked boilers to pulverized fuel firing. The benefit or otherwise of such a change depends largely upon circumstances. If the unit is working with a steady load, any alteration in which occurs comparatively slowly, a mechanical stoker can be as efficient as pulverized fuel. If sudden peak loads are experienced, the latter is better. The higher the peak load, and the more suddenly it is liable to be applied, the more does pulverized fuel firing rise superior to mechanical stoking. Pulverized fuel owes its superiority partly to its ease of control, but mainly in its ability to maintain efficiencies of about 80 p.ct. when working at a load as high as 400 p.ct. on the normal working. Using a coal with an infusible ash, 90 p.ct. of the latter passes up the stack and is discharged into the atmosphere. It is a fallacy to imagine, states Mr. Chapman, that use as pulverized fuel is an ideal method of utilizing accumulations of low-grade fuel. It is true that, for steam-raising, almost any solid fuel can be burnt as powdered fuel with a comparatively high thermal efficiency; but it is cheaper to generate steam with pulverized high-grade bituminous coal than with a low-grade fuel. The coal should contain between 16 and 30 p.ct. of volatile matter; and the best coals for the purpose contain between 20 and 26 p.ct. It is believed that semi-coke produced by low-temperature carbonization should be satisfactory in every way. Pulverized fuel is not ideal for open-hearth melting.

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.

Physical and Chemical Survey of the National Coal Resources.

An important aspect of the work on fuel research undertaken by the Department of Scientific and Industrial Research is a survey and classification of the coal seams in the various mining districts by means of physical and chemical tests in the laboratory, supplemented where desirable by large-scale tests at H.M. Fuel Research Station, East Greenwich, or elsewhere. The Fuel Research Board consider that the best way to carry out this work is by means of local committees representing the local colliery owners and managers, the local branch of the Institution of Mining Engineers, the Fuel Research Board, and the Geological Survey of Great Britain, as well as outside scientific interests. Each committee is charged with the duty of supervising the work of the physical and chemical survey in a coal-mining area; and in this way the survey becomes of practical value from the commencement, since local knowledge and experience are made available, and the seams to be investigated and the general programme of work are decided by those who are able to estimate most correctly the relative importance of the problems to be solved. The seams selected undergo physical and chemical examination by local investigators appointed for the purpose, after which a final selection is made of those seams likely to justify experiments on a technical scale, in order to test their suitability for particular uses or methods of treatment.

Committees have for some time been actively at work in the Lancashire and Cheshire and in the South Yorkshire Areas. The Department recently appointed a Committee for work in the North Staffordshire Area.

A further Committee has now been formed to deal with the survey of the coalfields of Scotland. The coal owners of Scotland and the Mining Institute of Scotland are co-operating in this work; and the composition of the Committee is as follows:

Lanarkshire Coal Masters' Association.
Mr. R. Forrester.
Mr. W. Thorneycroft.
Mr. J. Robertson.
Fife and Clackmannan Coal Owners' Association.
Mr. C. A. Carlow.
Lothian Coal Owners' Association.
Mr. J. Clark.
Ayrshire Coal Owners' Association.
Mr. M. Brand.

} Representing the coal owners of Scotland.

Prof. R. W. Dron, representing the Mining Institute of Scotland.
Prof. T. Gray.
Mr. M. Macgregor, Assistant Director for Scotland, Geological Survey.
Dr. C. H. Lander (*ex-officio*), Director of Fuel Research.
Mr. F. S. Sinnatt (*ex-officio*), Superintendent of the Physical and Chemical Survey of the National Coal Resources.

Hydrogenation and Liquefaction of Coal.

Previous results of experiments on this subject conducted in the Mining Research Laboratory of the University of Birmingham have been noted in the "JOURNAL" (April 22, p. 242; July 22, p. 222). In the earlier experiments the maximum yield of material soluble in phenol was obtained with the durain from the White seam, South Staffordshire; 45 p.ct. of the original coal (dry and ash-free) being rendered soluble. The tar produced, soluble in both phenol and chloroform, amounted to 37·5 p.ct. on the original coal. Shatwell and Bowen showed that with Arley coal all but 16·14 p.ct. can be converted into liquid and gaseous products; the tar yield being 61·4 p.ct. In view of Bergius' claim (English patent No. 148,436, 1921) that coals containing less than 85 p.ct. of carbon may be completely converted to liquid and gaseous products, leaving nothing but the ash of the original coal, it was considered desirable to ascertain the extent to which geologically more recent and more highly oxygenated coals could be converted into oil by hydrogenation under conditions of temperature and pressure similar to those employed in the experiments referred to; and in "Fuel in Science and Practice" for November, D. G. Skinner and J. Ivon Graham describe this third stage of the work. The materials used included brown coal, normal and recent Devonshire lignite, and low-temperature coke obtained from the latter. The experiments detailed show that the yield of tarry oil is not appreciably greater with coals of recent geological age than with bituminous coals previously tested. The tar yield was similar in quantity in both the brown coal and the normal lignite, amounting in each case to approximately 40 p.ct. on the original ash-free dry material.

MIDLAND JUNIOR GAS ASSOCIATION.

[Mr. O'Callaghan explains the simplicity of the "base-exchange" method of water softening. He emphasizes the particular need for feeding soft water to waste-heat boilers, and details striking results gained by the "Permutit" plant.]

There was a good attendance of members of the Association at a meeting at the Council House, Birmingham, on Thursday, Nov. 19. Mr. G. H. GEE presided.

The CHAIRMAN, according a welcome to Mr. J. P. O'Callaghan, referred to the excellent contribution on the subject of water softening made by him to the Institution of Chemical Engineers at Leeds in July. In the past few years there had been a revolution in the method of steam-raising on most gas-works, and Mr. O'Callaghan had shown that he was well alive to the relation between that alteration and the necessary changes in the method of water softening.

WATER SOFTENING FOR WASTE-HEAT BOILERS BY THE "PERMUTIT" BASE-EXCHANGE PROCESS.

By J. P. O'CALLAGHAN, F.C.S.

[Extracted.]

This paper was on the lines of that written by the author, and read on his behalf by Captain E. Brook-Pyke at the annual meeting of the Irish Association of Gas Managers last September—see "JOURNAL" for Sept. 16, p. 674.

After dealing with the causes of "hardness" in waters—stating that magnesium chloride is a dangerous salt to have in a boiler feed—Mr. O'Callaghan went on to say that the disadvantages of the lime-soda process are the relatively large space required for the reaction and settling tank, the continual re-adjustments necessary, the need for constant testing, the greater dependence on the human factor than in the case of the "Permutit" process, the formation of a large quantity of solid sludge which has to be got rid of, and the labour involved in cleaning and changing filters—though the latter is minimized in some types of plant by the provision of automatic filter-cleaning gear.

THE "PERMUTIT" PROCESS.

The "Permutit" process softens water completely in an entirely different way from that employed in the lime process. Permutit softens water instantly, by mere contact, no precipitate being produced. All that is necessary with this system is a suitable bed of base-exchange material, with arrangements for allowing the water to flow through it at a prescribed rate. When the softening capacity of the bed is exhausted, the permutit material can be completely regenerated by passing through it a solution of common salt (sodium chloride), and made ready to soften a further quantity of water. The "Permutit" plant consists simply of a cylindrical tank containing a bed of permutit. Connected with this tank is a small one in which is prepared the salt solution for regeneration. The control of the plant is easy, and can be carried out by unskilled labour. The attention required varies from twenty to forty minutes per day, according to the size of the installation.

The mineral compound, which has this extraordinary power of softening water without itself becoming dissolved or changing externally in any way, is one of a family of chemical substances having the property of base-exchange. These occur naturally in many parts of the world; and their peculiar property of exchanging lime, magnesia, sodium, and many other metals when brought into contact with solution containing these substances was first pointed out by an Englishman named Theodore Way, who was Chemist to the Royal Agricultural Society in London in 1850.

LASTING QUALITIES OF NATURAL PERMUTIT.

This natural material possesses great hardness and stability coupled with intense activity of exchange power and capacity for extremely rapid regeneration. One of the greatest advantages of natural permutit is the durability of the product itself, since this governs the all-important question of depreciation of capital outlay. With the natural permutit, complete immunity exists from any destructive action of free CO_2 in the water. In fact, natural permutit can itself be put into weak sulphuric or hydrochloric acid without the slightest fear of damage—and this latter fact furnishes an easy means for cleansing the material from any iron or other deposit which may after many years of continuous running accumulate in it.

Another most valuable asset of the natural permutit is a greater completeness of softening power than has been possessed by any previous zeolitic material. This is shown by the fact that water of any hardness can be reduced by filtration through natural permutit to a total content of lime and magnesia not exceeding 0·25 part per 100,000, or 0·17 grain per gallon.

WASTE-HEAT BOILERS AND HARD WATER.

Each 100,000 gallons of hard water evaporated will deposit in the boiler: 143 lbs. of scale-forming matter for every 10 degrees of hardness; 215 lbs. for every 15 degrees; 358 lbs. for every 25 degrees. Scale in a boiler causes (*a*) a great waste of heat, and (*b*) an enormous unnecessary strain on the boiler.

The fuel waste is not of cardinal consequence in the case of a waste-heat boiler; but to this must be added the wages paid for periodical chipping and cleaning, and the bill for boiler compounds and so-called scale-looseners, chemical or mechanical. The extra strain on the boiler may be gauged from the fact that whereas the temperature of a clean boiler plate is 350° Fahr., the temperature of the same plate covered with ⅛ in. of scale is 750° Fahr.—*i.e.*, the scale-covered plate has to be heated 400° Fahr. above the temperature required to convert the water into steam. This is often a source of serious loss, and sometimes of danger. A ½-in. furnace plate covered with 1-10th in. scale is as efficient a heat retarder as a steel furnace plate 10½ in. thick.

There is abundant evidence that, where waste-heat boilers are employed, it is essential not only to soften the water, but to soften it by the "Permutit" base-exchange process. In one of the best known and most widely used types of waste-heat boiler, the effect of even a small quantity of deposit—such as would be put down on the bottom tube plate by an ordinary lime-softened water containing (say) 3° of hardness per gallon—is to cause such an overheating of this plate that leakages between the ends of the tubes and the plate speedily become apparent. It has been found with these boilers that water from an ordinary lime-soda plant which would be considered to be well softened, and carrying only two or three grains of hardness-forming salts per gallon, is unsuitable for use with the waste-heat boiler.

The "Permutit" process has been adopted for the softening of the feed water at a number of important gas-works using waste-heat boilers; and the results have proved brilliantly satisfactory.

BOURNEMOUTH TESTS.

A series of tests was carried out in the laboratory of the Bournemouth Gas and Water Company, where "Permutit B" plant has been in use for a considerable time. The water after treatment is used for feed for waste-heat tubular boilers and Stirling boilers; and the analysis of the hard water before treatment is similar to that obtained from the London Metropolitan Water Board's mains—viz., about 20° of hardness.

Record of Degrees of Total Hardness of Treated Water just before Regeneration, from Dec. 18, 1923, to Jan. 27, 1924 (inclusive).

1923.	1st Shift.	2nd Shift.	3rd Shift.
Dec. 18	2·4	5·5	0·9
Dec. 19	1·4	0·0	0·8
Dec. 20	0·6	0·2	0·9
Dec. 21	1·1	0·0	1·2
Dec. 22	0·1	0·9	1·1
Dec. 23	1·2	1·5	—
Dec. 24	2·8	0·7	1·4
Dec. 25	1·1	1·8	1·1
Dec. 26	0·9	1·0	1·2
Dec. 27	1·0	1·0	0·0
Dec. 28	1·8	0·7	0·0
Dec. 29	1·0	0·9	0·6
Dec. 30	1·4	0·9	0·9
Dec. 31	0·7	0·0	1·3
1924.			
Jan. 1	—	0·6	0·9
Jan. 2	—	1·9	1·0
Jan. 3	0·0	0·9	2·7
Jan. 4	0·0	1·0	0·4
Jan. 5	0·8	1·8	1·6
Jan. 6	0·1	0·8	3·7
Jan. 7	1·3	—	1·7
Jan. 8	0·5	0·1	4·3
Jan. 9	0·0	0·3	1·1
Jan. 10	0·8	4·0	0·5
Jan. 11	1·0	0·0	1·1
Jan. 12	3·8	0·0	0·7
Jan. 13	—	—	—
Jan. 14	0·4	1·0	3·2
Jan. 15	0·4	0·4	0·0
Jan. 16	0·0	0·8	0·4
Jan 17	0·9	0·2	0·0
Jan. 18	0·4	1·3	0·9
Jan. 19	0·9	0·9	0·0
Jan. 20	1·4	0·9	0·9
Jan. 21	0·0	0·8	0·5
Jan. 22	0·9	0·0	1·2
Jan. 23	0·1	1·2	0·4
Jan. 24	0·1	0·9	0·4
Jan. 25	0·1	2·6	0·1
Jan. 26	0·1	1·1	1·4
Average	22·5 0·6°	28·6 0·75°	29·5 0·77°

Two facts present themselves, and both of them are of great importance: (1) The analysis shows that in spite of the pump having been occasionally overrun—for instance, on the first and second shifts on Dec. 23, first shift on Dec. 24, and first shift on Jan. 12—the average hardness of the treated water in the first shift is 0·6°, second shift 0·75°, and third shift 0·77°. The figures show that with such ordinary handling of the plant as can be given in a busy gas-works, where operation goes on for twenty-four hours per day (the plant being worked in three

shifts of eight hours), practically perfect softening can be obtained; and we are confident that such results cannot be obtained by any other material but "Permutit B." An order for a second installation has since been received from the Bournemouth Gas and Water Company.

The performance of the Bournemouth plant has been duplicated at the Stratford Works of the Gas Light and Coke Company, where two installations are at work. A boiler of the waste-heat tubular type was recently opened for inspection after eight months' continuous working day and night; the hard water being treated containing 17° of hardness in grains per gallon, of which 15° represents carbonate hardness. The boiler was found to be free from the slightest trace of scale. At these works "Permutit B" plant has been in operation for nearly three years; and with ordinary attention in respect of blowing-off the boilers, and thus keeping the concentration in hand, excellent results have been obtained.

At the Belfast Gas-Works the plant is used to soften water for a battery of waste-heat boilers on the vertical retort installation; and its normal capacity is 1500 gallons per hour. At present the average demand on it is about 700 gallons per hour. The water used is the overflow from the water-cooled condensers; it reaches the plant at a temperature of about 110° Fahr. and is of about 6·12 English degrees of hardness. It is pumped through the plant at a pressure of 30 lbs. In these circumstances the plant runs for about 36 hours without attention, and softens from 24,000 to 26,000 gallons before regeneration is required. Regeneration is carried out in 15 minutes—5 minutes for injecting the salt solution and 10 minutes for washing down, the latter operation requiring from 300 to 350 gallons of water. The amount of salt used is 50 lbs. per regeneration, which works out at 2 lbs. per 1000 gallons. No extra labour is necessary, the tests being taken periodically by the boiler attendant. After being once shown the method of operation, the boiler attendant has no difficulty in carrying-out the regeneration himself. Several of the waste-heat boilers had been working continuously for two years; and as some of the water tubes were not easily accessible, they had not been cleared during that period, so that there was a heavy deposit of scale of a very hard nature, which was difficult to break even with a hammer and chisel. On commencing to use the soft water, the effect was at once noticeable, as the boiler gauge glasses, which it had been found impossible to keep clean previously, at once cleaned-up. After working for a fortnight with the soft water, a boiler was opened for inspection, and it was found that the hard scale in the tube plate had been loosened and broken-up so that it was easily removed, and the heavy scale in the tubes themselves was disappearing, so that it seemed that within a short time the soft water would have the effect of removing the scale, and the trouble and expense of dismantling the boiler for cleaning would be avoided.

Discussion.

The CHAIRMAN said that Mr. O'Callaghan's scientific survey of the subject was lucid and thorough. As a works chemist he had greatly admired the way in which the facts were marshalled. The various methods of dealing with troublesome salts were most informative.

Mr. C. F. TOOBY, Senior Vice-President, in proposing a vote of thanks to the author, pointed out that the contribution would not only be useful for reference, but would serve an excellent purpose in directing close attention to what was a most important subject. It was essential for the proper and efficient working of boilers that the water should be treated in a softening plant. He agreed that it was necessary to have nickel alloy fittings. At Foleshill a lime and soda plant, capable of treating 120,000 gallons a day, had been very satisfactory. A special feature about it was in respect of the rate of travel of the water through the plant before it reached the filtering medium. The result was that a lot of the precipitate settled down in the body of the container; and therefore did not contaminate the filters. Blowing-down should be carried-out regularly. At Foleshill they did it every shift. He would like to know whether the author would recommend that water of great hardness should be softened by "Permutit" or similar systems, or whether it would be better first to soften-down by the lime and soda process, and then apply "Permutit."

Mr. H. R. HEMS (Vice-President), seconding the resolution, said he felt there was great need for distribution men to consider the questions raised, particularly having regard to the possibilities of the gas-heated boiler. It was evident that some of them would before long be up against this question of water softening, for the applications of gas-heated boilers were rapidly on the increase.

Mr. TWINE (Chemical Engineer, Birmingham Gas Department) said he was engaged in water softening thirty years ago, and having since taken a keen interest in the subject, he was sure there was no branch of chemical science that had been so well worked out. They had listened to a most authoritative address. The first problem that presented itself on the works was that of good water—how it was to be obtained. Enumerating many of the methods adopted for treating water, he alluded to that of oil separation, observing that it frequently happened that the water on the works contained traces of oil. Coke filters were often employed to take out the oil, but they were expensive. Success was usually achieved by passing an electrical current through the water. The sedimentation process was also useful. For the treatment of corrosive water, manganese steel shavings were used. In Birmingham the trouble arising from boiler corrosion was great; and it was a source of mischief, particularly in the waste-heat boilers. There were so many methods for water softening that the form of plant must be determined by particular conditions. There was not a "best" plant. It was important to provide a system which would permit of additions being made easily. With very hard water, lime and soda treatment should generally be applied first, to be followed later by "Permutit." It was important that the filtration area should be in every way adequate.

Mr. O'CALLAGHAN, having acknowledged the vote of thanks, said that, for waters abnormally high in carbonate hardness, it was desirable from both the economic and the technical standpoints that pre-treatment by lime should be instituted for the removal of the carbonate hardness, if "Permutit" was employed afterwards. Many combined lime and "Permutit" plants were at work; and the results had been extremely satisfactory as regards both the cost of treatment and the suitability of the treated water for all purposes. He was tempted to think, however, that where one was dealing with a water of 40 or 50 degrees of hardness, treatment by the lime-soda process alone would produce a water sufficiently good for most purposes, though not good enough for evaporation in waste-heat boilers. It depended, of course, on what type of lime-soda softener was employed. Water softening by the precipitation method was a precise chemical operation which involved adding to the water calculated quantities of certain reagents (lime, soda, barium compounds, alumina, &c.) capable of interacting with the impurities present in the water, to produce insoluble precipitates. These were then removed by settlement and filtration, so that the water after treatment contained only a residuum of its former hardness. It was obvious that in such a procedure the first essential was accurate automatic measurement of both chemicals and water, and the second was the capability of ready adjustment of the measuring gear employed, so as to meet the variations which frequently occurred in the initial hardness of water supplies, or in the strengths of the commercial reagents used. There was little doubt that the primary cause of the comparative failure of many existing types of water softeners was that in these plants such exact measurement was not attempted; the proportioning of chemicals and water being roughly effected by dividing slides, lift pipes, floats, cups and scoops, &c., none of which could accomplish close measurement. If the essentials outlined were attended to, a correctly designed and carefully operated lime-soda plant could be depended upon to reduce the hardness of almost any water supply to something between 2° and 8° Clark, depending on the efficiency of the particular make of softener employed. The treatment of each individual water by the precipitation method was a separate problem in itself; and any attempt to apply one stereotyped method to all waters was foredoomed to failure. Every water had its own reaction time; each water reacted better to a particular proportion of reagents than to any other; some waters clarified rapidly; while others would not clarify at all without special treatment. The successful designing of plant to deal thoroughly with all these varying aspects of water purification by the precipitation method called for a high degree of chemical and engineering knowledge, and wide practical experience. The treatment of the water by empirical specifics, such as algin extracts, tannin extracts, dilute linseed oil, molasses, &c., would hardly commend itself to any responsible engineer, as these nostrums had fortunately been thoroughly exposed in recent years. Apart from the positive damage to the boiler by internal corrosion, which had now been definitely traced in many instances to the use of such substances, the folly of paying (say) 4s. 6d. a gallon for a compound containing 85 p.ct. of water and under 1 p.ct. of actual softening reagent, in the hope that this would exert some ameliorative influence on the deposit of scale, was sufficiently obvious.

Gas for Enamelling Sanitary Ware.

A number of interesting industrial applications of gas in Baltimore were described in a recent issue of the "American Gas Journal" by Mr. C. C. Krausse, Superintendent of Fuel Sales to the Consolidated Gas, Electric Light, and Power Company of Baltimore. He quoted as a typical case of gas replacing coal a plant enamelling sanitary ware. Coal was formerly used in this plant, firing a muffle furnace. After making a detailed study of the coal operating conditions, it was decided that they could do away with the muffle, and, in order to prove that the quality of the enamel ware would not be reduced, the Company conducted experiments in a small portable direct-fired gas furnace under reducing, oxidizing, and neutral atmospheric conditions. The coal furnace used 13 tons a week, working 24 hours a day, six days a week, and banked on Sunday. Assuming 12,000 B.Th.U. per pound of coal, then the total heat used per week was 312,000,000 B.Th.U. The gas fired furnace used 192,000 c.ft. of gas for six days' operation, and 8000 c.ft. for heating-up on Sundays, making a total of 200,000 c.ft. a week, or 100,000,000 B.Th.U. Production was actually increased 42 p.ct. with the gas fired furnace. Therefore, the total B.Th.U. per week on the basis of the same amount of production as the coal furnace was 70,000,000 B.Th.U.—in other words, 70,000,000 B.Th.U. in the form of gas replaced 312,000,000 B.Th.U. in the form of coal. Gas also replaced coal for the smelting of the enamel. Here, again, the Company made radical changes in furnace construction. An average of 241 lbs. of coal, or 2,892,000 B.Th.U. were used to smelt a batch of enamel of 480 lbs. This was exclusive of the coal to bring the furnace up to the desired temperature. Only 2700 c.ft. of gas, or 1,350,000 B.Th.U. were used with gas—a ratio of over 2 to 1. Further, the labour cost per batch is considerably reduced. Another item is the furnace repairs, which are considerably less with gas than with coal. When all factors are considered, the resultant unit cost of operation in this plant is lower with gas than with coal.

AMERICAN GAS ASSOCIATION.

REPORTS AND PAPERS REVIEWED.

Second Article.

STUDY OF COKE CHARACTERISTICS.

The Carbonization Committee's work is divided into several branches, each of which is delegated to a Sub-Committee. The Operators' Section have undertaken a study of (1) the relative characteristics of the modern types of carbonizing units, and (2) of the various characteristics of "the real major product—the resultant coke." A start has been made with Pittsburgh coal, as it comes from the field that produces the largest tonnage of gas coal in the country, and thus is typical of the majority of conditions. In conducting the tests, no effort is being made to determine which plant is the most efficient. What may be regarded as more efficient for one set of conditions may be entirely wrong in another location, depending upon the form in which the B.Th.U. are most valuable. One point that is to be investigated is the naphthalene content of the crude gas produced by the various types of plant when using the same coal. The study of coke is being undertaken by Mr. R. T. Haslam, of the Massachusetts Institute of Technology, and by Mr. A. C. Fieldner, on behalf of the United States Bureau of Mines. The former has issued a progress report, and the latter an account of the tests which the Bureau of Mines propose to undertake of coke produced by the different plants.

In a preliminary statement, Mr. A. M. Beebee, of the Rochester Gas and Electric Corporation (who is Chairman of the Major Committee), pointed out that a carbonizing plant is primarily a coke-producing plant, and little research has been revealed regarding the relative characteristics of the resultant cokes from various types of plants. Considerable research has been carried on in America and elsewhere concerning the characteristics of coke from blended coals, but practically nothing along the line of a given coal in different plants. Operating experience in the States—particularly in water gas plants—has frequently shown that cokes possess wide ranges of characteristics. Experience in England with the use of coke in open fireplaces has probably more clearly brought out that various cokes have wider ranges of characteristics than might at first be realized—particularly as regards reactivity or combustibility when applied in their field of use. Apparently, from the research on the problem to date, volatile matter is of little consequence. Coke cell structure, porosity, character of carbon formation, the degree of cracking of the gas, &c., all have their effect on the characteristics of the coke. These are, in turn, affected by the process of their formation—*i.e.*, temperature, time, and many other factors. Reasons are given for attaching the utmost importance to a careful study of the relative rate of reactivity of coke under varying conditions—for instance, in a water gas plant, in a producer, and in a domestic furnace. There is also to be a study of the relative amounts of the various sizes of coke produced; of handling characteristics; of density and weight per cubic foot; of the ease of ignition; and of porosity, cell structure, apparent and actual density, &c.

LOW-TEMPERATURE CARBONIZATION.

The report of the Low-Temperature Carbonization and Complete Gasification Section of the Committee was concluded by the Chairman (Mr. A. W. Warner, of the Philadelphia Suburban Gas and Electric Company) in the following terms: "When the economics of low-temperature carbonization are demonstrated and put to use, the gas manufacturer will be interested, as far as it affects his present practices, in two phases —the substitution of lean gas for carrying on the process so as to release the high B.Th.U. gas for distribution, and the marketable domestic fuel. Both gaseous and solid fuel will become more and more his province. His attitude seems to have gradually changed from downright scepticism to a feeling that some time some investigator will reach an economic answer to this problem of low-temperature carbonization. To date he feels there is nothing in sight to warrant any change in plans for expansion of his more conservative high-temperature methods, for he can at least make room for a successful process as an auxiliary to his existing plant."

COMPOSITION OF LOW-TEMPERATURE TARS.

The report of the Carbonization Committee was accompanied by a series of papers, one of them by Messrs. J. D. Davis and A. E. Galloway, of the Pittsburgh Experiment Station of the Bureau of Mines. In this, the authors remarked that the heat-transfer problem is a major one in the design of low-temperature carbonization apparatus. A few basic heat-transfer methods are now generally recognized as feasible by engineers working in the low-temperature field. The most important of these are: Heating thin layers of the coal; stirring the charge while heating; transfer of heat by direct contact with hot gases; and utilization of the carbonization reaction heat. Practically all the processes now being developed are based on one of these four methods or on some combination of them. The plan of the authors' investigation included the selection of tars from well-known semi-commercial processes based on these methods, and analysis by a uniform standard system for low-temperature tars which has been developed in the Bureau of Mines laboratory; but unfortunately it was not possible to obtain tar samples for the different methods from the same coal. Furthermore, the conditions under which the tars were condensed were subject to considerable variation. Hence one is not justified in attaching significance to small differences in character of the tars. The coals were all coking coals rich in volatile matter.

In general, it may be said that there is little variation in the character of the tars with temperature, provided this is within the low-temperature carbonization range (475° to 700° C.). The total tar oils distillable varied from 65 to 78 p.ct.; the total tops distillable to under atmospheric pressure varied from 30 to 47 p.ct.; the boiling ranges lie close together. As regards the composition of the tops, the tar acid content varied from 30 to 46 p.ct., unsaturated compounds from 39 to 54 p.ct., and sulphonation residue from 6 to 21 p.ct. But none of these variations can be correlated with temperature variations alone. The yield of tar, however, is lower as the carbonization temperature approaches the upper limit of the range. Variation in time of carbonization does affect the character of the tar. The most pronounced effect is obtained by rapid generation of the tars, as where the heat is quickly applied to the coal in thin layers. Tars so generated are characterized by a high yield of very light liquids, high specific gravity, high viscosity, high free carbon, high unsaturation, and low tar acid content. Where the heat is applied at a moderate rate, and the tar vapours are quickly removed from the carbonization apparatus, as by internal heating with inert gases, the tar shows characteristics that are opposite to those stated above, except as regards the total tar acids, which are practically the same. In the latter case, the sulphonation residue (paraffins) is high.

DOMESTIC COKE.

The subject of "Domestic Coke and Factors Affecting Coke Formation" was dealt with by Messrs. J. D. Davis and L. C. Karrick (of the Pittsburgh Experiment Station of the Bureau of Mines), who stated that the densest and probably the best coke for domestic heating purposes is produced by high-temperature carbonization methods; and the coals best suited for this purpose are those ordinarily looked upon as coking coals. It is possible to produce dense domestic fuels by low-temperature methods by briquetting before carbonization or by briquetting the carbonized residue. An excellent product can be made by carbonization of briquetted low-temperature coke; but it has not been demonstrated that this method is economically feasible. In the light of recent research it seems clear that certain constituents which may be separated from the coal by solvents are responsible for coke cementation, and that others likewise separable are responsible for its swelling tendencies. It is believed that a closer study of the properties of these constituents will be of material aid, not only in the selection of coals for coking, but also in plant design.

GLOVER-WEST INSTALLATIONS.

The Builders' Section contained illustrated descriptions of gas manufacturing plant by various leading makers, and included a report of the West Gas Improvement Company, New York City, by Mr. F. J. Kennedy. This gave, among a number of other installations, figures relating to the 2½ million c.ft. plant brought into operation last February at Malden (Mass.), which showed that the guarantees have, in the working results, been more than fulfilled in every respect. A Glover-West plant at Toronto is being built within the walls of a horizontal retort house; and the new 5 million c.ft. installation will occupy the same space as a 1½ million c.ft. horizontal retort plant. At the time of the preparation of the report there were 183 Glover-West installations in operation and in course of construction, of which 17 were for gas-works in the United States and Canada.

DISTRIBUTION.

Another bulky document was the report of the Distribution Committee, which was signed by the Chairman (Mr. H. E. Bates, of the People's Gas Light and Coke Company, Chicago), and dealt with a great number of matters, bearing chiefly upon mains. Assuming that the investment in a distribution system, consisting of mains, meters, and services, represents from 40 to 60 p.ct. of the total investment of any company, and that the larger portion is no doubt in the mains, the Committee felt that anything they could do to reduce the investment in, or maintenance of, mains, either by improved design of a main system or by better methods of installation or maintenance, would represent an enormous saving to the gas industry as a whole. To this subject, therefore, the Committee confined their attention during the year; a number of questions being sent to, and answered by, each member. The diversity of opinion indicated by the replies showed the need for full discussion; and accordingly a two-days' conference was arranged in Detroit, to which all gas men were invited. At this meeting there was recognition of the need of a more complete standardization of practice. The various answers to the questions referred to above were summarized in the report.

LIFE OF PIPE.

Replies to a request for data regarding the actual life of cast-iron, wrought-iron, and steel pipe failed to record a case

of failure of cast-iron pipe chargeable to corrosion from causes other than electrolysis. Cast-iron pipe is still in service which has been in the ground over 40 years in 24 answers, over 50 years in 23 answers, over 75 years in 7 answers, and over 100 years in 1 answer. As to wrought-iron pipe, opinions and experiences again differ. Several answers reported wrought-iron pipe in use for over 50 years, and still apparently in good condition; while others made reference to renewals at from 25 to 40 years. Generally the opinion seemed to be that wrought-iron pipe, when laid in a non-corrosive soil, and not subject to electrolysis, should last at least 50 years. There appeared to be considerable hesitation in predicting the probable life of steel pipe, though opinion favoured the expectation of as long a life for steel pipe as for wrought-iron pipe, when laid under the same conditions.

Members were asked what they considered the maximum pressure for which cast-iron pipe should be used, assuming that a joint could be made which would stand the maximum pressure that the pipe would stand; and the general opinion expressed was that it should not be employed where the gas pressures exceed 25 lbs. Several replies, indeed, limited the pressure to 10 lbs.

The use of centrifugal pipe was dealt with; but it was felt that experience was so limited that no conclusions or recommendations could be formulated at this stage.

Questions were also asked with reference to conditions of use of different types of joints; but the replies were so varied that it was impossible to draw any conclusions from them, except that there is real need for intensive study by a special committee. The Committee thought that there should be closer agreement between distribution engineers on the subject of joints.

Depth and Gradients of Mains.

There were replies from 35 companies to the question, "What do you consider the minimum depth of cover for main installations?" Just half of them favoured 3 ft.; while ten named greater depths (up to 4 ft. 6 in.), and eight gave shallower depths (the extreme being 1 ft. 6 in.). The same number of answers were received to a query as to the proper gradient to allow on main installations. Opinion here seemed to be as varied as in the case of depth. The extremes named were $\frac{1}{32}$ in. and 2 in. in 12 ft. The view was expressed in the report that all gas mains should be laid with a minimum of $\frac{1}{4}$-in. gradient per 12 ft. length.

Liquid Purification.

A number of problems confronting the chemist in the gas industry were enumerated by Mr. A. F. Kunberger, Chief Chemist to the U.G.I. Contracting Company, of Philadelphia. One of these was in connection with liquid purification, or the removing of sulphuretted hydrogen from gas by passing the gas counter to the flow of a solution of alkali carbonates, forming sulphites and bicarbonates, and subsequently revivifying this solution by blowing air through it in a separate vessel. From a purification point of view, this process is a success; its flexibility and efficiency have been established beyond doubt. There remains, however, to be found a practical method of eliminating the nuisance of the sulphuretted hydrogen gas issuing from the actifier. Of course, said Mr. Kunberger, one way to do this would be by passing the air from the actifier through iron oxide. In the present system of oxide purification one is hampered by the fact that with a flow of foul gas the capacity of the oxide is limited; but when foul air is passed the oxide acts as a catalyzer rather than as an absorbent. It will therefore be able to decompose a great many times the amount of sulphuretted hydrogen that it now absorbs. Thus the cost of the oxide would have little effect upon the total cost of purification; nor would the labour charge be higher than is involved in blowing the sulphuretted hydrogen into the air. Since the vessel containing the oxide will not have to be gas-tight, the oxide could be moved mechanically. Not only would the cost of material be negligible, but the final product should have a market value perhaps in excess of its initial cost.

Total Gasification.

The problem of total gasification of coal was considered by Mr. Kunberger, who, after referring to various proposals, suggested the following as a more promising process: A long-type generator, the blast gases being taken off about the centre, leaving a large carbonizing chamber above the take-off, is used. In addition to a more direct connection between the blue gas generator and the carbonizing chamber, one has the radiant heat of the coke fire directly upon the lowest layer of the coal, which has perhaps been half-carbonized by the hot gases before reaching this zone. Though there is some trouble in clearing the generator fires, this method is the most promising one. As it is now operated, some of the coal gas and oil vapours from the chamber above are forced down, due to both formation and expansion during the blast period; but this can easily be remedied by having an opening in the gas valve large enough to release the pressure and permit the gases from the coal to enter the seal during the blast period. A little producer gas may thus leak-over with them; but this could be kept down to a point where it would not seriously affect the composition of the gas by an excessive amount of inerts. Operating with this modification it is claimed would yield per short ton of 2000 lbs.:

60 lbs. of $(NH_4)_2 SO_4$.
30 to 40 gallons of low-temperature tar.
44,000 c.ft. of gas of 363 B.Th.U.

By returning the 30 to 40 gallons of tar, which for the most part is a paraffin oil, to the gas, one would probably get a gas with a somewhat higher calorific value.

Effect of Sulphur on Coal Storage.

The question is continually being raised, What are the conditions which furnish the initial increments of heat in a mass of coal, assuming the absence of extraneous sources? Abundant proof is at hand, state S. W. Parr and E. R. Hilgood in the November issue of "Fuel in Science and Practice," showing that oxygen is absorbed by coal and enters into heat-producing reactions at comparatively low temperatures; but this does not furnish evidence as to the source of the initial heat for starting the process. As studies connected with the sulphur in coal proceed, it is evident that its possible rôle in the oxidation processes must be given further consideration. In this connection, the estimate of Parr and Kressman regarding the amount of heat evolved in the oxidation of pyritic sulphur is of interest, in view of the bearing which small increments of heat may have as a booster for further oxidation activities both of the hydrocarbons and of the sulphur constituents. According to calculations, 0·1 p.ct. of sulphur in the pyritic form will, on oxidation, raise the mass through a temperature of 14·5° C. Hence the oxidation of so small an amount as 0·5 p.ct. would result in a heat rise of 71·5° C.—a really dangerous boost. The work of Yancey shows the distribution of pyritic sulphur in microscopic form to be as common as in the massive form. Other investigation demonstrates that fusain frequently has a high sulphur content. If it is also in a finely divided condition, it is especially liable to start oxidation.

B.E.S.A. Publications.

The British Engineering Standards Association have just published the following new and revised British standard specifications: "Reciprocating Steam Engines for Electrical Purposes" (No. 42-1925); "Gas Engines for Electrical Purposes" (No. 120-1925); "Heavy Oil Engines for Electrical Purposes, Airless-Injection Cold-Starting Type" (No. 213-1925); "Heavy Oil Engines for Electrical Purposes, Diesel Type, Air-Injection" (No. 211-1925); "Heavy Oil Engines for Electrical Purposes, Surface-Ignition Type" (No. 212-1925). The specification for reciprocating steam engines is a new edition of the original specification No. 42-1909. The four specifications for gas engines and heavy oil engines were prepared concurrently; and the aim has been to secure consistency and uniformity regarding the salient features. The rating in each case is defined as the load in brake-horsepower which the engine can carry continuously for a period of 12 hours at its rated speed when working under the stated conditions of pressure and temperature; and in the case of gas engines, with gas of the stated calorific value. The engine must be capable of developing for one hour 10 p.ct. above this rating. Clauses have also been included regarding the selection of the size of engine required to suit the capacity of a specified generator; the cyclic irregularity and the question of flywheel; the permissible variation in speed for paralleling and governing; the allowance to be made when an engine is working under non-standard atmospheric conditions; gas or fuel consumption; and tests and standard equipment. Copies of these specifications may be obtained from the B.E.S.A. Publications Department, No. 28, Victoria Street, S.W. 1. Price 1s. 2d. each, post free.

Chemical Engineering Group.—A paper will be read at a meeting of the Group on Jan. 8, by Mr. A. Edgar Knowles, on "The Manufacture of Hydrogen Suitable for the Hydrogenation of Oils," and another by Dr. A. C. Thaysen, on "The Production of Hydrogen by Micro-Organisms."

Pulp Binders for Briquettes.—A paper written by Mr. C. J. Goodwin (in conjunction with Dr. G. N. White), and presented last month to the South Wales Institute of Engineers, dealt at some length with the use of pulp binders for briquettes. It stated that, to prepare a pulp binder, vegetation—which may consist of grass, straw, water reeds, or other plant tissue—is stacked in a suitable manner for a period depending upon the character of the vegetation and the atmospheric temperature. A rise in temperature occurs, but damage through over-heating is not likely to result. The stacked vegetation is watered from time to time with a small quantity of a solution of substances requisite for the growth of the organisms; these substances being of simple inorganic nature. After a period which will vary between three weeks and three months, the vegetation will have been reduced by fermentation to a pulpy mass consisting of a mixture of the binding substances (mucus and humus) and residual fibres. The material is rendered alkaline by the addition of 2 p.ct. of its dry weight of sodium carbonate; and it is then ready for use.

THE SMITH SEAM OF THE LANCASHIRE COALFIELD.*

Fuel Research Board Survey

The Survey Papers of the Fuel Research Board form a series of reports on matters connected with the physical and chemical survey of the coal seams of Great Britain. Report No. 5, which has recently been issued, describes laboratory experiments carried out for the Department of Scientific and Industrial Research by the Lancashire and Cheshire Coal Research Association.

The Smith seam is well defined over a large area of the South Lancashire Coalfield, and is being extensively worked, though rarely exceeding 2 ft. in thickness. The seam appears to be represented in the Burnley Coalfield by the Dandy Mine. The desirability of studying this and similar thin coal seams from the chemical and physical aspects needs no emphasis, since the subject of winning thin seams becomes of greater moment as the thicker ones become exhausted.

The coal is bituminous, strongly caking, and is employed for general industrial and household purposes, for blending with other coals, for gas making, and in the manufacture of metallurgical coke. The volatile matter in the seam varies somewhat in different districts; and in order to offer a comparison of the coal substance, the volatile matter has been calculated on the moisture-free and ash-free basis. The amount present is relatively high, varying between 36 and 40 p.ct. The values obtained are compared in the following table:

Locality.	Atherton.	Bicker-shaw.	Coppull (Section A)	Coppull (Section B).	St. Helens.	Burnley.
Volatile matter in "tops," p.ct. . .	38·8	40·5	36·2	37·4	35·5	39·7
Volatile matter in "bottoms," p.ct. .	40·5	37·9	36·7	39·7		37·2

The seam contains generally a low percentage of ash; and the white ankerite partings, which form a characteristic feature of the seam, exercise an influence on the amount of ash as determined by analysis. A portion of the ankerites is eliminated during the purification process, and the amount removed tends to increase as the size of the grades decreases, though there may be a tendency for the smaller sizes to contain a higher percentage of ash than the larger lumps. The percentage of ash in the seam is as follows:

Locality.	Atherton.	Bicker-shaw.	Coppull (Section A).	Coppull Section B).	St. Helens.	Burnley.
Ash in "tops," p.ct.	3·4	10·8	2·1	2·4	1·4	7·6
Ash in "bottoms," p.ct.	4·3	3·9	2·6	2·5		10·7

* "Physical and Chemical Survey of the National Coal Resources No. 5—The Lancashire Coalfield; the Smith Seam." Published by H.M. Stationery Office, Adastral House, Kingsway, W.C. 2; price 1s. 6d. net.

The report states that the composition of the ash from different horizons in the seam may vary. It has been found, however, that the melting-point is practically constant throughout.

The percentage of nitrogen in the seam is fairly high; the average figure being about 1·6 (calculated on dry coal). The sulphur content is variable. The following figures are calculated on the dry coal:

Locality.	Atherton	Bicker-shaw.	Coppull (Section A).	Coppull (Section B).	St. Helens.	Burnley.
Sulphur, p.ct. . .	1·63	3·51	1·26	1·11	1·32	6·37

The amount of sulphur in the section of the Dandy seam from the Burnley Coalfield is higher than that in the Smith seam. Since only a small proportion of the sulphur occurs in lenticular form, the seam cannot be purified to any great extent by ordinary washing; and the report goes on to say that, judging from the froth-flotation tests of this section of the Dandy seam, the sulphur is present in such a form as to render it difficult to reduce the percentage to a figure which would make the seam of value for producing metallurgical coke.

The complete ultimate analyses of samples of the seam are summarized in the following table:

Locality.	Atherton.	Bicker-shaw.	Coppull (Section A).	Coppull (Section B).	Burnley.
Calculated to dry coal—					
Ash	1·94	7 49	2·40	2·53	8 61
Carbon	81·63	76·63	81·64	81·32	74·05
Hydrogen	5·21	4·79	5·03	5·19	4·90
Nitrogen	1·63	1·42	1 65	1·75	1·71
Sulphur	1·63	3·51	1·26	1·11	6·37
Difference (oxygen and errors)	7·96	6·16	8·02	8·10	4·36
Calculated to dry ash-free coal—					
Carbon	83·25	82·83	83·65	83·43	81·03
Hydrogen	5·31	5·18	5·15	5·32	5·36
Nitrogen	1·66	1·53	1·69	1·80	1·87
Sulphur	1·66	3·79	1·29	1·14	6·97
Difference (oxygen and errors)	8·12	6·67	8·22	8·31	4·77
Calorific value (air-dried coal)—					
B.Th.U. per lb.	14,230	13,815	14,430	14,420	13,730

A series of "float-and-sink" tests was carried out to obtain information on the working properties of the seam from the Atherton district. The results show that this seam lends itself to purification by washing. Experiments in a small froth-flotation plant with a sample of fine slack from the Dandy seam prove the efficiency of the process for this material.

The conclusion is drawn in the report that the Smith seam, though thin, is to be regarded as valuable. It is in many respects similar to the Arley seam, a report of which formed the substance of Survey Paper No. 3.

Definitions of Bitumen and Bituminous Coals.

To the November issue of "Fuel in Science and Practice," E. R. Franz contributes a compilation of definitions of the words "bitumen" and "bituminous coal." On this subject Stopes and Wheeler stated last year that, so far as resins in coal are concerned, a certain amount of confusion may arise from the grouping sometimes made of the "bitumens" with the resins. Modern usage of the term "bitumen" embraces in its widest sense all the various descriptions of naturally-occurring hydrocarbons, but usually refers only to the solid forms ozokerite and asphalt, and most often treats "bitumen" and "asphalt" as synonymous. At all events, the materials regarded as bituminous are hydrocarbons, generally slightly oxidized, or in combination with sulphur, and are thus essentially different from the resins, which always contain oxygen as the important constituent. The solid bitumens are usually looked upon as having resulted from the combined action of evaporation and atmospheric oxidation on liquid petroleum as it issued from out-cropping strata; and despite the unfortunate appellation "bituminous" (which popular and trade usage have rendered immovable), coals do not contain bitumen. It is true that many coals contain free solid hydrocarbons (waxes), to which the term bitumen might be applied; but these probably arise accidentally, and rarely exceed 0·5 p.ct. of the total weight of the coal. The "Encyclopædia Britannica" states that the most important class of coals is that generally known as "bituminous," from their property of softening when heated to a temperature far below that at which combustion takes place. This term is founded on a misapprehension of the nature of the occurrence. Bitumen does not exist in coal. The subject of nomenclature of bituminous substances will shortly be examined by an authoritative committee; and it is to be hoped that a standard scheme will be adopted.

Wellman Gas Producer.

A new type of gas producer, known as the "L" type, has been brought out by the Wellman Smith Owen Engineering Corporation, of Kingsway, W.C. 2, and was described in a recent issue of the "Iron and Coal Trades Review." It is a self-contained unit, and is entirely automatic from coal feed to ash removal. The driving mechanism has been simplified, the poker action has been remodelled, there is an intermittently rotating ash pan, and a three-port steam-jet blower is provided, and also a steam-driven turbo blower, if desired. With these improvements the results claimed to have been obtained are: Increased mechanical efficiency, greatly increased gas-making capacity, more uniform quality of gas, no clinkering on the brick lining, hand poking entirely eliminated, and reduced maintenance cost. The "L" type producer is made in two sizes, one having an efficient gasifying capacity of 1500 to 2750 lbs., and the other of 2500 to 4000 lbs., of bituminous coal per hour. Both sizes are fitted with the Wellman mechanical coal feed, whereby the rate of coal delivery is regulated to the demand for gas, and at the same time is measured. The oscillating water-cooled mechanical poker, extending from the top of the producer into the fuel and combustion zones, is at work all the time, and its influence is felt down to the bottom of the fire. It is inclined at an angle to the vertical, oscillating in a path which forms the frustrum of a cone, and is mounted in a large circular bearing. It has, therefore, in its travel an upward and downward swing from the centre of the producer to the brick lining of the shell and backward. These combined actions keep the fuel free and loose, close any incipient holes, maintain a fuel bed of uniform density, prevent clinkering, and force the incipient clinkers down into the ash zone. The ashes are assisted in their descent from the combustion zone by the down-stroke of the poker, the action of a hexagonal hood, and the intermittent rotation of the ash pan. This action also has the effect of crushing any clinker.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Coke Competition Paper.

SIR,—I have had my attention drawn to an error which occurs on p. 5, Table 3, of the Special Number of the "JOURNAL" dated Nov. 9 last.

In column 3 of that table, line J, dealing with the size of blast-furnace coke, the size of coke is given as "medium *below* 1¼ in., uniform in size." This should, of course, have read "medium *above* 1¼ in. uniform in size."

This is so obviously a mistake that I have hesitated about making a correction, but hope, if you think fit, that you will give publicity to this letter.

E. W. SMITH,
Technical Director.

Woodall-Duckham Companies,
Research Section and Laboratories,
52, Grosvenor Gardens, London, S.W. 1.
Dec. 17, 1925.

Mr. R. N. Webb's Presidential Address.

SIR,—With regard to the discussion on Mr R. N. Webb's Presidential Address to the Yorkshire Junior Gas Association, which was published in your issue of Dec. 9, I should be pleased if you would make a correction in the report of my remarks, which, owing probably to abbreviation, do not convey what I intended, and, additionally, are obviously incomplete.

I said that Mr. Webb advocated small nostrils for producer gas and secondary air, and later in his address advocated reducing the thickness of the walls and decreasing the spacings of the brickwork. This meant that there would be greater surface of brickwork and more spaces in the setting. I was of the opinion that these conditions were favourable to more intimate contact between the combustible gases and the incandescent brickwork, and resulted in more localized combustion, instead of the long flame combustion upon which Mr. Webb had expended a great deal of thought, and to achieve which he had considerably modified the design of his new settings. I therefore asked Mr. Webb if, with the greater exposed brickwork surfaces, he had found localized combustion to occur in actual practice, or if the alterations had no influence on the length of the flame.

In the experiment where a producer fire was only pricked, but not clinkered for 14 days, it should have been stated that during this period the quantity of producer gas was always adequate to maintain the necessary temperatures in the setting. The CO_2 content of the producer gas rarely exceeded 4 p.ct. My point was that it was advisable, in the interests of good working, to cut clinkering down to a minimum.

F. FIRTH.

17, Thorn Lane, Gledhow, Leeds.
Dec. 19, 1925.

Horizontal Retort House Practice.

SIR,—I have noticed in your issue of the 16th inst., Mr. Foott's letter dealing with certain parts of my paper on "Horizontal Retort House Practice," which appeared in your valuable Journal on Nov. 18 last.

In reply to Mr. Foott, I should like to point out that the endothermic reactions to which he refers may be considered as imposing what may be likened to a Customs Duty upon the original heat content of the solid fuel on crossing the frontier between the solid and gaseous states. This "tax" has to be met from the original heat content of such solid fuel, and must consequently be classed as a loss if the efficiency of the process is calculated, as it should be, in relation to the original heat content of such solid fuel.

T. ANTHONY CANNING.

Gas-Works, Newport (Mon.),
Dec. 19, 1925.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The Safeguarding of Industries (Customs Duties) Bill passed the third reading on Thursday, Dec. 17.

Special Orders Approved.

The Audley Gas Order, Bollington Gas Order, Tamworth Gas Order, and the Worthing Gas Order were approved last Monday on the motion of the Earl of Plymouth. The Sidmouth Gas Order was also approved, with modifications.

HOUSE OF COMMONS.

The Safeguarding of Industries (Customs Duties) Bill, after being considered in Committee, was reported without amendment, read the third time, and passed.

Local Authorities (Sale of Coke) Bill.

In the House of Commons, on Wednesday, Dec. 9, Mr. Beckett asked leave to introduce a Bill to extend the powers of local authorities, empowering them to supply coke. Extracts from the speeches made are given below.

Mr. BECKETT said there had been a continual agitation on the question of the supply of coke to the poorer people of the country. He hoped, therefore, that the House would combine to do everything possible to see that people in the industrial areas were going to be able to get some kind of cheap and adequate fuel. He went on to give one or two extracts from the report on this subject to the London County Council. The report started by saying that:

> We have had under consideration from time to time cases in which the existence of serious short-weight in deliveries of coke has been established, but in which we have been advised that no effective legal action was possible under the existing law.

It further pointed out that local authorities had continually made attempts to deal with the problem, but the law had not been able to assist them in the matter. Then there was a long list of ordinary cases of short-weight delivery of coke. Mr. Beckett instanced one case, in which a load of coke represented as "¼ chaldron" was weighed and found to consist of 188 lbs. only, instead of approximately 336 lbs. The coke was being sold on the "tally" system to a poor person, the charge being 7s. 6d., which worked out at 4s. 6d. a cwt.

Mr. Beckett then pointed out that in May, 1924, the attention of the President of the Board of Trade was directed to the frauds in the sale of coke in a number of cases, mention being made of the fact that the public did not get the quantities they paid for or expected to receive. The one argument that had been urged in favour of the coke merchants was that they could not help themselves. If they put water into the coke, this overweighted it. The London County Council in their minutes stated that they had carried out investigations into this subject. They bought coke in the ordinary way of the retail trader, and they took care to buy it on a day when there had been no rain for at least 24 hours. The coke purchased was taken to the County Hall, and samples of 15 lbs. were taken, placed in an open basket, and watched for a six weeks' period. During this time the samples continued to lose weight. This meant that the average samples of coke bought from the different merchants in London had a tremendous artificial increase in price. The proposal advocated was that inspectors should be appointed and the law strengthened in order to deal with the matter. He contended, however, that it was much cheaper to supply coke direct than to employ a large number of officials and pay them big salaries for what had been described as hampering private enterprise. If private enterprise could not deliver the goods without the public having to pay thousands of pounds in salaries to have that supply, then, said Mr. Beckett, let efficient borough councils take on the job. He hoped the House would realize how important the Bill was to the poor people.

Major COLFOX took it that the Bill which Mr. Beckett had asked leave to introduce was to all intents and purposes the same which he brought forward some few months ago, except that then he was asking that local authorities should be given powers to supply coal, while in the present instance it was coke. It seemed to him (Major Colfox) that the arguments which were conclusive in regard to the sale of coal by local authorities were equally conclusive in regard to the sale of coke. These arguments were that a public body like a local authority could not reasonably deal with the same efficiency as those engaged in the trade in order to make a living out of it, and, consequently, experience had shown that in almost every instance where the State or municipality had undertaken trade operations, they had done so at a loss. Therefore, in the interest of consumers and also in the interests of those same people in their capacity of ratepayers, he asked the House not to give a first reading to the Bill, because the general public were bound to suffer in two respects—namely, in the loss of efficiency, and, secondly, in the rates which would have to be paid to make up the loss on the trading operations.

The motion to bring in the Bill was defeated.

Gas Regulation Act.

Last Thursday, on the motion of Sir Burton Chadwick, approval was given to the draft Special Orders relating to the Audley U.D.C., Bollington U.D.C., Great Yarmouth Gas Company, Tamworth Gas Light and Coke Company, and the Worthing Gas Light and Coke Company. The Special Order of the Sidmouth U.D.C. was also approved, subject to a slight modification in clause 15.

Coke Watering.

Replying to Colonel Day, who drew attention to the practice by retailers of watering coke in order to increase the weight, Mr. SAMUEL said he was aware that complaints as to short deliveries of coke had been made from time to time. Some local authorities had taken powers by local Acts to deal with the sale of coke with a view to the prevention of fraud. The matter was being carefully watched.

Public Utility Companies—Lists of Directors.

Mr. W. BAKER asked the President of the Board of Trade whether he was aware that the Bristol Water Company and the Bristol Gas Company were not required to file lists of Directors and other information at Somerset House, because they were incorporated by Special Acts of Parliament which contained no clauses requiring them to furnish lists of Directors which should be open to public inspection; how many public utility companies were in a similar position; and

whether he would consider the desirability of introducing a short Bill to remove these exceptions.

Sir P. CUNLIFFE-LISTER, in reply, said he was aware of the facts stated in the first part of the question. Regarding the second part, the figure asked for could not be given without a search which would involve considerable labour and expense. As to the third, having regard to the fact that Parliament had not hitherto, either in general legislation (the Companies Clauses Act) or in companies' Special Acts, seen fit to require the filing of lists of Directors, &c., he did not think there were sufficient grounds for introducing legislation to prescribe such a requirement.

Electricity Development.

Captain BOURNE asked the Minister of Transport if he could state whether the report of the Special Commission appointed to inquire into and report upon the future development and control of electricity had yet been presented; if so, was he in a position to make any statement on the subject; and could he say whether it was proposed to publish the report.

Colonel ASHLEY stated that he could not add anything to the previous statements which had been made, to the effect that the report had been received and was under consideration.

HORLEY COMPETING ELECTRICITY SCHEMES.

The electricity supply schemes put forward by the Horley District Gas Company and the Horley and District Electricity Supply Company were discussed further on Thursday, Dec. 17, when the Special Order promoted by the Electricity Company was considered by the Special Orders Committee of the House of Lords.

In the present session of Parliament, the Horley District Gas Company promoted a Bill to obtain powers to supply electricity. This Bill was passed by a Committee of the House of Lords, but was rejected by a Committee of the House of Commons. By the time the Bill reached the Committees, the Horley and District Electricity Supply Company had promoted an Order for the supply of electricity in an area which included Horley, but which was not so extensive as that proposed by the Gas Company; and this Order had been approved by the Electricity Commissioners. The Order was the subsubject of a debate in the House of Lords on Dec. 8 (see "JOURNAL" for Dec. 16, p. 737) and on Dec. 15 (see Editorial Article on p. 775 to-day). The Special Orders Committee, which considered the Order on Thursday, was presided over by the Earl of DONOUGHMORE (the Lord Chairman), and among the Peers present was the Earl of Clarendon, the Chairman of the Select Committee of the House which had passed the Gas Company's Bill at the beginning of the session.

The Gas Company were represented by Mr. E. Campbell Cooper (Messrs. R. W. Cooper & Sons, Parliamentary Agents), and the Electricity Company by Mr. W. Sedgwick (Messrs. Rees & Freres, Parliamentary Agents).

Mr. COOPER opened his remarks by stating that in nothing in any observation it was his duty to make did he desire to convey the slightest suggestion of impropriety or irregularity of conduct on the part of anybody to whose conduct he would refer. He then compared the procedure with regard to the obtaining of electricity powers before and after the constitution of the Electricity Commissioners, in 1919, under the Electricity (Supply) Act of that year, and criticized the policy of Government Departments trying to give Parliament a lead. Previously, promoters of electricity schemes had to apply to the Board of Trade for a Provisional Order. All parties concerned were heard by the Board of Trade; and if the Board were satisfied with the application, they granted an Order which was subsequently embodied in a Confirmation Bill in Parliament. That Bill was considered by two Committees of Parliament, so that both the promoters and any opponents there might be had the advantage of appearing before two tribunals. The tribunal now substituted was the Electricity Commissioners, composed largely of exceedingly able and eminent men, closely connected with electrical interests. One could well understand that these gentlemen thought there was "nothing like leather;" they might even have thought that gas companies were a sort of parasitical excrescence in the industrial world. However that might be, it had been stated by Sir Harry Hayward (the Vice-Chairman of the Commissioners) before the House of Commons Committee which had considered the Gas Company's Bill, that the declared policy of the Commissioners in reference to gas companies having electricity powers was that they should only be allowed to have those powers in cases where no other companies were undertaking the responsibility, except in special cases. Under the present procedure, if anyone was dissatisfied with what the Commissioners had done, a memorial could be presented to the Minister of Transport, who was bound to hold an inquiry. Thus, there had been substituted for the old Committee procedure inquiries by two new tribunals—the Commissioners and the Ministry of Transport. If there was nothing in the fact that they were new tribunals, he could not refrain from commenting that it had never been his good fortune to have an inquiry conducted by one of the Commissioners themselves, and one could well understand that the parties concerned liked to come face to face with the tribunal which was to determine their fate. He did not consider that the procedure substituted by the Electricity Act was a satisfactory substitution for the searching inquiries provided for by the old procedure.

Mr. Cooper then discussed the history of the promotion of the Gas Company's Bill and the Electricity Company's Order. He poimted out that the Gas Company had intended for a considerable time to obtain power to supply electricity, but could not do so except by promoting a Bill in Parliament. They had postponed action, however, in view of the promotion, by Mr. Clarry, M.P. for Newport, of the Statutory Gas Companies (Electricity Supply Powers) Act, to enable statutory gas companies to obtain electricity powers by Special Order. This Bill was blocked by the exigencies of public business in the 1923 session (it had been passed in 1925), and accordingly the Gas Company had decided to proceed with their own Bill rather than to wait, and run the risk of further delay. In July, 1924, the Electricity Commissioners were informed that the Company's Bill was to be promoted, and in the autumn the preliminary steps were taken for the promotion. When the Bill was deposited, a copy was sent to the Commissioners, so that they were privy to the fact that the Gas Company were desirous of obtaining electricity powers. The Electricity Company was formed by local gentlemen, and had made application to the Commissioners for powers to supply, though the facts as to the Gas Company's intentions were known locally.

Mr. Cooper then went on to point out that the Electricity Commissioners had considered and approved of the Electricity Company's scheme, and had granted the Order, without having given the Gas Company an opportunity of being heard, although this Company had lodged objections. The Gas Company, therefore, had decided, in view of this decision, that it was no use asking for the matter to be re-opened. He then proceeded to discuss the report on the Gas Company's Bill submitted to the House of Lords Committee by the Minister of Transport, in which it was stated that the Commissioners were satisfied with the technical scheme submitted by the Electricity Company in their Order. Mr. Cooper described that report as a veiled suggestion to the Committee to reject the Bill. The Minister knew nothing of the merits of the schemes in the Bill or the Order, and it was only natural to assume that the Commissioners might have inspired the Minister with their views as to policy, upon which they had based their decision to allow the Order to proceed. Under the provisions of the Electricity (Supply) Act, the Minister could be called upon to act in a judicial capacity as an appeal court from a decision by the Commissioners, but the tenor of his report, unwittingly no doubt, clashed with the judicial spirit in which no one more than the Minister himself would desire to approach the subsequent consideration of the report of the person whom he had directed to hold the inquiry.

The Gas Company felt that they had been placed at a great disadvantage by the terms of the Minister's report, and for this and other reasons had reluctantly come to the conclusion that no useful purpose could be served by their appearing on their Memorial to the Minister of Transport. They had this anomalous position, therefore, that the Gas Company, who were concerned to use every legitimate means to defeat the Order, had, from no fault of their own, been precluded from stating their case in opposition before both of the subordinate tribunals concerned, and had consequently no alternative but to concentrate on this appeal to the present Committee.

Mr. Cooper then dealt with the change of ground on the part of the Electricity Company during the proceedings before the House of Commons Committee. Whereas it had been concluded that the best means of supply in Horley would be to obtain a bulk supply from another authority, such a supply was not available, and both the Gas Company and the Electricity Company, in their schemes, had proposed to generate locally. At the eleventh hour, however, towards the end of the proceedings before the House of Commons Committee, the Electricity Company had produced a bulk supply arrangement, the supply to be given by the County of London Electric Supply Company. Inasmuch as the scheme supported by the Electricity Commissioners and the Minister of Transport provided for local generation, however, why should the Electricity Company have put forward the bulk supply scheme? The reason was that they had sold themselves body and soul to the County of London Company for £500, because, during the House of Commons proceedings, the Gas Company had extracted with great difficulty, in the course of cross-examination, a letter which showed that the County of London Company had agreed to contribute £500 towards the expenses of the Electricity Company. It mattered little to the former Company when the bulk supply would be forthcoming. They knew perfectly well that they could not give the bulk supply at that time, because their mains were miles away from Horley. A bulk supply would have been just as much available to the Gas Company as to the Electricity Company. The Gas Company would have welcomed it if they could have got it, but could not. Between the Horley district and the point at which the County of London Company's mains at present terminated there was a gap of 13 miles, in which were situated the districts of Merstham and Nutfield. In the debate in the House of Lords on Dec. 8, Lord Gainford had said that the distance was four miles, and that in the next few weeks an Order would be secuured for the County of London Company to continue their main to the Horley district. How did Lord Gainford know that this Order would be granted in a few weeks? (The Order referred to is to enable the County of London Company to supply in Merstham and part of Nutfield.) An ex-Electricity Commissioner had recently become Manager of the County of London Company, and his appointment had been made at a psychological moment for that Company. He believed they were claiming that they had, or ought to have, exclusive rights for bulk supply in the county itself. Was it too much to assume, therefore, that they had been very anxious to use this little Company as a means by which they could establish a footing in the County of Surrey? So far from its being possible to get the Order through in a few weeks, it had not yet been passed by the Electricity Commissioners. It had been referred to the Home Counties Joint Electricity Authority for their consideration—an authority which had only been created a week or two ago. Mr. Cooper did not think they had even got their staff together yet; and when that Authority settled down to work, was it reasonable to assume that the first matter they would consider was the Merstham Order? Even when they did take it up, it had to go to the Electricity Commissioners for their decision, then to the Ministry of Transport, in case of an appeal being made against it, and then it had to go before both Houses of Parliament, which might not even be sitting. The Order might not reach the final stage until some time in 1927.

In a statement presented to the Committee by the Gas Company, it was asked how it was that, assuming the impossible had happened, and that a practicable bulk supply was available, the present Order

as confirmed by the Minister still retained its original form, authorizing a local generation scheme, and was silent about any bulk scheme. Again, supposing the bulk supply scheme should never materialize, the extraordinary position would arise that the promoters would, if the present Order were approved, be free to put into force a scheme which one Committee of Parliament had rejected and about which the other had not heard a word.

A Bill was to be deposited by the Gas Company in the coming session of Parliament, for the purpose of giving the Gas Company powers to supply electricity, as in the last Bill, but the area over which it was asked that the powers should apply was to be extended to include that part of Nutfield not included in the County of London Company's Order. In the last Bill, an obligation was imposed by the House of Lords to supply electricity within a year from Royal Assent, and that provision was also inserted in the new Bill. Therefore, if the Gas Company obtained their Bill, they would be ready to supply electricity in Horley before the bulk supply would be available. The Bill included part of the parish of Nutfield which was not within the area covered by the County of London Company's Order, so as to enable the Gas Company to take a bulk supply of electricity from the County of London Company when it was available, because the electricity areas of the County of London Company and of the Horley Gas Company would then be contiguous. The only difference between the two competing schemes in Horley was that the Electricity Company could not move a foot until the bulk supply was available, whereas the Gas Company could provide a supply before the bulk supply was available. In addition, the Gas Company would be in a position to negotiate on more favourable terms, because they would have their generating plant. It could not be said that the Gas Company would be so foolhardy as to erect a generating station to supply the whole area at once. Owing to the fact that they could use waste heat from the gas manufacturing plant for generation, they would be able to generate sufficient electricity for the first stage of the business possibly more cheaply than they could get it from the County of London Company. He also pointed out the advantages of an existing statutory gas company as compared with a new electricity company. These were that capital could be raised more easily and more cheaply by the gas company; dividends would be limited; electricity would be cheaper, by reason of the spreading of overhead charges, the utilization of waste heat for generation, and the use of the same directors, staff, offices, and showrooms; a gas company would commence electricity business with an established clientèle; and the repeated interference with roads would be avoided.

In responding to a question by Lord MUIR MACKENZIE (a member of the Committee), Mr. Cooper asked if it were suggested that there was a possibility of the Committee deciding to refer the matter back to the Ministry of Transport.

The CHAIRMAN said it had been mentioned as one of the possibilities.

Mr. COOPER said it appeared to him that there was no necessity for a further inquiry. He contended that the proceedings before the Committee in the House of Lords were exhaustive as to who should have the right to supply.

The CHAIRMAN pointed out that the House of Commons had disagreed, and therefore there was disagreement between the two Houses.

Mr. COOPER said it was putting him in a rather difficult position if he were to be judged now by the effect of the decision of the House of Commons Committee, and if that decision were to be regarded as setting up a condition of things which necessitated a further inquiry. He asked the present Committee to endorse the decision of the earlier House of Lords Committee, and in effect to say that the whole circumstances concerning the promotion of the Electricity Company's Order were not such as to justify the passing of an affirmative resolution.

The CHAIRMAN said that was not before the present Committee; it was a matter for the House. The Committee had been instructed to advise the House whether or not a further inquiry was desirable, and he understood Mr. Cooper to say it was not.

Mr. SEDGWICK, for the Electricity Company, said they did not fear a further inquiry; they were confident that, in view of the strength of their case, if there was a further inquiry, the decision would be in their favour. At the same time, he supported Mr. Cooper in saying that there was no necessity for further inquiry. Regarding the Electricity Company, the total capital raised to date was £10,262, of which £9482 had been subscribed by local residents. The Engineers had offered that if not less than £10,000 was subscribed locally, they would find half the remaining necessary capital up to £5000.

Mr. Sedgwick then dealt briefly with the history of the Electricity Company, which had its origin in a meeting of residents in January, 1923. The consulting engineers had negotiated for over a year for the purpose of obtaining a bulk supply, but this could not be arranged at the time. The prospectus was issued in September, 1924, and the minimum amount of capital, £10,000, was soon subscribed. After the necessary steps were taken, and the Order was deposited with the Electricity Commissioners, a representative of the Commissioners had visited Horley, and, as a result, they gave permission to erect a small generating station. When the Gas Company's Bill had been thrown out by the House of Commons, the Minister of Transport had held an inquiry, but the Gas Company had decided not to attend. The Minister had agreed to the granting of the Order, the House of Commons had approved, and nothing remained but the approval of the House of Lords. The very fact that the Gas Company had not presented a petition against the Order in the House of Commons was an argument that there should not be further inquiry. The Gas Company had claimed that when their Bill was passed by the Committee of the House of Lords, that Committee had, *ipso facto*, rejected the Electricity Company's Order. This was not so; the Order was not before that Committee, and had not been rejected by anybody. If the Electricity Company had been promoting a Bill instead of an Order, however, this might conceivably have been the result.

With regard to the Bill to be promoted by the Gas Company in the next session of Parliament, he said it was hard on the inhabitants of Horley, and particularly on the residents who had put up their money to float the Electricity Company and get an independent supply of electricity, that their Order should be held up pending the promotion of another Bill by the Gas Company. The decision of Parliament on the first Bill should be taken as final. Further, if the Gas Company wanted electricity powers, they were now free to do what they had said over and over again they wished to do—namely, to apply to the Electricity Commissioners for a Special Order.

As to the attack made on the Electricity Company—that they had thrown out their original scheme, and had put in another at the eleventh hour—he said that the new scheme was put forward by the Company's Counsel to the House of Commons Committee in his speech, which preceded the calling of witnesses. Therefore, the Company did not make the alteration at the eleventh hour.

If the present Order was granted, it was the intention of the Electricity Company to promote another Order, authorizing the extension of the area of supply to include that part of Nutfield which was not included in the County of London Company's Order. There had been discussions with the road authorities in Merstham and Nutfield with regard to the laying of mains for the bulk supply from the County of London Company's existing mains to the Horley district until powers were obtained by the two Electricity Companies to supply in Merstham and Nutfield, and consent had been obtained for the laying of those mains. Therefore, there was little more than technical procedure remaining.

In the course of discussion, it was stated that the Electricity Commissioners could give consent for the laying of mains for the purpose of bulk supplies in the event of agreement with the local authorities and road authorities.

In reply to questions, Mr. Sedgwick said that, if the Horley Electricity Company obtained their Order, and mains could be laid through Merstham and Nutfield, a supply could be given within six months.

The CHAIRMAN asked why, if the Horley Electricity Company were to obtain a bulk supply, they retained power in their Order to erect a generating station, and to generate locally.

Mr. SEDGWICK said it might be necessary at some future time to erect it. Also, a proviso had been added, to the effect that the power to erect it could only be exercised in the future with the consent of the Commissioners.

The CHAIRMAN pointed out that the Company were asking Parliament to pass their scheme in preference to the original scheme, on the ground that the present scheme provided for bulk supply, which the previous one did not. He did not think it would be contested that, on the whole, the practice of Parliament in the last few years had been to encourage generating in large areas on a large scale, rather than in small areas. Also, it was not the practice of Parliament, in the ancillary system of Private Bill Legislation, to give promoters facilities which they did not want. It was conceivable, if the Order were passed in its present form—though he did not say the Company would do it—for the Company to throw over the bulk supply scheme, and go back on the policy of Parliament, though it was true that it could only be done with the consent of the Electricity Commissioners.

Mr. SEDGWICK said the Electricity Company would raise no objection to the passing of the Order subject to the deletion of the power to erect the generating station.

Dealing with the statement that over and over again Parliament had granted electricity powers to gas companies, Mr. Sedgwick said there were only 21 or 23 such cases, and he believed that less than ten gas companies were putting their electricity powers into operation. There was one case in which powers to supply both commodities had been exercised by one company successfully; but in six cases the electricity powers had been revoked, in two cases they had been transferred to another company, and in another case the company had transferred their gas powers to another company. Therefore, there was no great demand in this country for powers to distribute electricity as well as gas. There was a great objection to the granting of double powers, in that a local authority had power, under the general law, to purchase the electricity undertaking in its area, and it would be understandable, therefore, if a company supplying both commodities was not keen to push electricity. He believed this was the reason why gas companies having electricity powers were reluctant to use them.

If it was really felt that the House of Lords could not approve of the present Order at once, and that there should be a further Parliamentary inquiry, Mr. Sedgwick urged that the inquiry should be made by a joint committee of both Houses of Parliament. Also, if there was to be an inquiry by a joint committee, he asked that the committee should not be set up until there had been time for the Electricity Commissioners and the Ministry of Transport to consider the Electricity Company's new Order for powers to extend the area of supply to include Nutfield. Nutfield was in the area of the London and Home Counties Joint Electricity Authority, and that Authority had power to supply there. It was likely that they would appear as opponents to an Order for the extension of the area, whether promoted by the Electricity Company or the Gas Company, but he was not sure on that point.

Mr. COOPER protested strongly against any reference to the Electricity Commissioners of the Gas Company's Bill or the Electricity Company's Order for the enlarged area. If there was to be a tribunal, it should be a joint tribunal of both Houses of Parliament. Commenting on Mr. Sedgwick's remarks, he said that a seductive programme had been put before the Committee by a small £9000 Company, who, if they got the present Order, were to promote another. He ventured to say that half the £9000 had already gone. After commenting further on the difficulties encountered by small companies in raising capital, he asked if the present scheme was not really the scheme of the County of London Company. If it was, then that Company should come forward, and promote it in their own name, and not under the guise of a small independent company. Again, if a new Order was to be promoted, why was it necessary

to pass the present Order? Why could not the whole area be included in the one Order? Mr. Sedgwick had said that he could not move yet, because he was dependent on the County of London Company, and also that the London and Home Counties Joint Authority had a claim on the extended area. Thus, there was another spoke in the wheel of progress. If those difficulties existed, what was the urgency for passing the present Order?

With regard to the statement that many gas companies having electricity powers did not exercise them, he said that in the bulk of those cases the powers were granted in the two or three years prior to the war, and that, therefore, the war had stopped the companies concerned exercising the powers.

Mr. Cooper said his point with regard to the present proceedings was that he was put at a disadvantage by the fact that there seemed to have been a departure from what he understood to be Departmental tradition in these matters. The tradition used to be that the Board of Trade, whom the Electricity Commissioners had superseded in these matters, would not consider it respectful, when there were competing measures, to proceed with the consideration of one issue before Parliament had dealt with the other. In this case, however, it seemed that the Electricity Commissioners were anxious to give Parliament a lead, and had, therefore, considered the Electricity Company's Order at the earliest possible moment. He knew of no other case in which the Commissioners had proceeded with such celerity.

Replying to the CHAIRMAN, he said the Commissioners had granted the Order before the Gas Company's Bill was rejected by the House of Commons Committee.

In another reference to granting electricity powers to gas companies, he said that the gas companies had pushed electricity supply with the greatest possible energy and enterprise, and in one case it had resulted in the electricity undertaking becoming the larger part of the whole. In the Horley case the Gas Company would show enterprise in pushing electricity, because one of the Directors of the Gas Company was responsible for the supply of gas and electricity by the Yorktown and Blackwater Company, where electricity was supplied by a gas company most successfully.

The Committee deliberated in private.

The Committee reported to the House that they did not recommend that a further Parliamentary inquiry should take place; but that, should the Order be approved, it should be approved subject to the omission of clause 8 and schedule 5.

When this report came before the House on Friday, Dec. 18, it was agreed to; and it was decided to resume on Dec. 21 the adjourned debate on the Earl of Clarendon's amendment to the motion of Viscount Peel, that the Special Order which was presented on July 15 be approved—viz., to leave out all the words after "That," and to insert "having regard to the decision of a Select Committee of this House upon the Horley and District Gas Company (Electricity Supply) Bill, the Special Order be not approved."

The debate was resumed on Monday, and the amendment was withdrawn; the Special Order being approved with modifications.

GREAT YARMOUTH GAS ORDER.

House of Commons Committee.—Wednesday, Dec. 16.

(*Before Mr.* J. W. HOPKINS (*Chairman*), *Sir* ROBERT BIRD, *Captain* BOURNE, *and Mr.* R. A. TAYLOR.)

The Order is one proposed to be made by the Board of Trade under section 10 of the Gas Regulation Act, to empower the Great Yarmouth Gas Company to extend their area of supply to include the rural districts of East and West Flegg, and to erect a gasholder on a site which has been acquired for the purpose. The Order also includes a number of miscellaneous provisions.

The Company were represented by Mr. F. J. WROTTESLEY. There was opposition from two householders who live in the vicinity of the site on which it is proposed to erect the holder. These objectors, Mr. J. D. Jones and Miss A. E. Puxley, were supported in their objections by the Parish Council of Caister, the township in which the site is situated; the ground of the opposition being that the amenities of the district would be affected. The objectors were represented by Mr. R. J. NEVILLE, M.P. for East Norfolk, who appeared as a Parliamentary Agent.

Mr. WROTTESLEY said that from time to time the Company had received requests from residents in Caister for a supply of gas; and, after a canvass had been made, it was decided to apply for an Order to empower them to extend their area of supply, and to furnish gas in Caister and other parts of the added area as and when the demand justified it. There were a number of villages in the area which could not get a supply of gas within a reasonable measure of time, except from the Great Yarmouth Company. It had been arranged to erect a holder in the centre of Caister, and to lay a 6-in. low-pressure main from the ends of the existing mains in Great Yarmouth (about two miles away) to the holder. The gas was to be manufactured in Great Yarmouth and stored at Caister, where it was to be put under pressure and supplied through small high-pressure mains to Caister and villages beyond it.

The Company considered the site acquired to be the most efficient from the point of view of gas supply, and the least objectionable from the point of view of the amenities of the district. Objections had been received from only six of the inhabitants; and two were appearing before the Committee to press their objections. As a result of the six objections, Mr. H. C. Honey (then Director of Gas Administration at the Board of Trade) held a public local inquiry, at which some of the objectors were heard. After Mr. Honey had submitted his report to the Board of Trade, the Order was sent to the House of Commons for approval. There was a debate in the House in August; and subsequently Mr. J. F. Ronca (now Director of Gas Administration) made further inquiry locally. Counsel could only suppose that it was as the result of Mr. Ronca's report that the Order had again been brought before Parliament for approval. It was then decided to refer the Order to the present Committee, so as to give an opportunity for objections to be raised. The only question which could be considered by the Committee was whether the Company were to be allowed to erect the holder. If they were not, it would mean that the Company would not be able to give a supply of gas to the inhabitants of other parts of the new area beyond Caister within a reasonable time, because it would not be an economical proposition to do so. The development of Caister was handicapped by the fact that there was at present no supply of gas or electricity there, and it was for this reason that the Company went into the matter. Some of the points raised by the objectors were clearly matters of public health; and one might have expected that if such matters were raised at all, it would have been by somebody charged with the duty of looking after the public health in the district, and not by individuals. No public health authority had raised objections. After the first debate on this matter in the House of Commons, the Company met the members of the Parish Council of Caister with a view to coming to an agreement, and the Council suggested alternative sites. These were, however, for one reason or another unsuitable. The maximum height of the gasholder would be 30 ft., so that it would hardly rise above the eaves of the houses springing up around it. It would be quite impossible to see the holder from Miss Puxley's house, but Mr. Jones might get a view of it. Counsel suggested that, weighing all the circumstances, and remembering that the supply of gas in the added area of supply depended very largely upon the holder and its site, the Committee should conclude that the objections of the two householders should not prevent the erection of the holder.

Mr. *P. D. Walmsley* (Engineer and General Manager of the Company) said a low-pressure supply beyond the holder in Caister would not be economical. He had been unable to find another suitable site for the holder.

Mr. NEVILLE (cross-examining) asked whether, when the Company were buying the site, they had stated that it was for gas purposes.

Witness: Not likely. [Laughter.]

Mr. NEVILLE stated that the site was situated at a point where public buildings would be erected in Caister, if, in the future, it was decided to erect such buildings. In his view the Company had asked for trouble by choosing the best site, in the centre of Caister, without saying anything about it, and then seeking powers to erect a holder there. He pressed the witness to say when the holder was likely to be erected.

Witness replied that he had not made up his mind, as it depended upon the development of the area. He would not give any estimate.

Mr. NEVILLE suggested, therefore, that there would be plenty of time before the erection of the holder to enable the Company to secure another site. Proceeding to address the Committee, he said that the people who would be affected by the erection of the holder were not in the position financially to defend themselves; and even the Parish Council were not in a position to defend them, as they would be if the rateable value of the property affected were higher. The Company had selected the one place in Caister which was likely to develop. If the holder were erected there, the class of property would always be the same as at present. In Caister there were the beginnings of an attractive watering-place; and the holder would practically blight the one part of the township where the natural development would occur. Referring to the debate in the House of Commons, he said he had spoken on behalf of Caister, and had received a degree of support from the House beyond his expectations. Very great sympathy was shown for Caister.

Mr. *J. H. B. Gedge* (Chairman of the Caister Parish Council) gave evidence in support of the objections. He stated that in the summer months there were about 1500 visitors to Caister, and the dedication of the site named to a gasholder would very seriously prejudice the chances of developing the township.

Mr. WROTTESLEY emphasized that the Company had not compulsory powers for the purchase of land, and nobody to-day could give them an alternative site. The question, therefore, was whether or not they were to be allowed to erect a holder on this site.

After the Committee had consulted in private for nearly half an hour,

The CHAIRMAN said they had decided, in view of their very limited terms of reference, which gave them no choice except to say "Yes" or "No," that the sections giving power to erect the holder on the proposed site should remain part of the Order. He expressed the hope, however, that the Company would take steps, by the planting of trees or by other means, so that the amenities of the district should not be interfered with.

Mr. WROTTESLEY said the Company had already offered to do this, and were willing to repeat the offer.

Mr. NEVILLE was of the opinion that the trees would not be of much use, but, at the same time, he was obliged to the Company for their offer.

Companies to Manufacture Gas-Fittings, &c.—Companies newly-registered include one under the title of Sherwoods, of Granville Street, Birmingham (capital £15,000), manufacturers of gas and electric fittings, &c.; and another under the name of J. Segal, of 4, London Wall Buildings, London, E.C. (capital £1000), manufacturers of accessories and apparatus in connection with gas and electric supply for lighting, cooking, and other purposes.

Gas Company's Christmas Tree.—The staff of the Newcastle and Gateshead Gas Company have placed in their showrooms in Grainger Street a Christmas tree, on which the employees have placed toys for the children at the Fleming Hospital. Anyone interested is invited to go and see the tree, and take the children, who, if they wish, may place a toy on it for the benefit of the sick children. The tree, with all its gifts, is to be taken to gladden the hearts of the children at the hospital on Christmas Eve; and the toys will be distributed by the matron on Christmas Day.

LEGAL INTELLIGENCE.

SEQUEL TO A GAS EXPLOSION.

Action against the Bradford Corporation

Tuesday, Dec. 15.

There was a sequel to a Bradford gas explosion in an action the hearing of which was begun to-day in the King's Bench Division before Mr. Justice HORRIDGE and a Special Jury. The plaintiff was Mr. Chas. Cyril Briggs, of Oak Mount, Manningham, Bradford, and the defendants were the Bradford Corporation. The plaintiff sought to recover damages for alleged negligence on the part of the Corporation's workmen in remedying a gas escape. The defendants denied negligence, and alleged that the damage sustained by the plaintiff was caused by the negligence of the plaintiff himself.

Mr. CONWAY appeared for the plaintiff; and Mr. VACHELL, K.C., and Mr. MICKLETHWAITE for the Corporation.

Mr. CONWAY said on Dec. 23, 1923, the plaintiff was about to leave his house to go for a Christmas holiday; and he went to the larder or cellar to turn off the supply of gas. In tapping the stiff lever with a hammer, he broke it. He at once got two Corporation men to come to the house; and they filled the leak with clay before plaintiff told them he would be away from the house for some time. The workmen then said that they would have to make a good job of it. Plaintiff heard a noise like the rattling of a box of matches; and this was followed by an explosion, which threw plaintiff down and burnt his hair. The house and furniture were damaged to the extent of nearly £1000. The defendants' suggestion was that the explosion occurred because there was a fire in the room above the larder, into which the gas had percolated. The plaintiff's reply was that there was no fire in the room at that time.

Plaintiff gave evidence in support of Counsel's opening statement. He said he watched the workmen repair the leak, and saw one of them move the pipe and then "audibly" touch what appeared to be a box of matches in his pocket. This amazed him; but he thought the men ought to know what they were doing. As he walked away, an explosion occurred, and he was thrown down. When he went upstairs later, he saw no fire in the room.

Mr. VACHELL cross-examined witness, who said he thought the workman struck a light to test the work he had done, and an explosion followed. He knew that neither of the workmen was injured, and that the meter was not damaged. He admitted that he had not complained to the Corporation of their workmen's conduct; and he had made no claim against the Corporation. The Alliance Insurance and Commercial Union had paid his claim in full.

Mrs. Briggs and her maid gave evidence that there was no fire in the room above at the time of the explosion. Evidence was also given as to the amount of damage done to the house by the explosion. One witness said that the appearance of the floors showed that the explosion came up from the larder.

Mr. *James Paterson* said he came to the conclusion that the ignition of the explosive mixture must have started in the larder.

Wednesday, Oct. 16.

Further evidence for plaintiff was given.

Mr. *G. M. Gill* said that, assuming that gas had been escaping from a pipe, and men were called in to repair the defect, the men should have made certain that there was no light in the house, and that the house was ventilated by opening all windows and doors. The last thing they should have done was to strike a match to look for the leak. He knew of a case where a number of people had been in the area of an explosion; and some had been injured, but not all. He was not surprised that the man alleged to have lighted the match was uninjured. Explosions sometimes produced curious results.

His LORDSHIP: Would any competent man test a leak with a naked light in a small room?

Witness: He would not be competent. I think it quite likely a gasfitter might do it.

This concluded the plaintiff's case.

Tom Simpson said he had been in the employ of the Bradford Corporation as a gas main layer for ten years. He was not a smoker, and never carried matches with him. When a fellow-workman named Dunn and he were taken by Mr. Briggs in his car to the house, Mr. Briggs was smoking a cigarette. They took with them an electric lamp, lumps of clay, and some tools. When they arrived at the house and alighted from the car, Mr. Briggs ran on in front. When witness got to the larder, he heard a sizzling noise. There was no difficulty in hearing where the escape was. He went up a stepladder, and Dunn handed him the clay. He was not on the ladder half-a-minute before the explosion occurred. The lamp was in Dunn's hand at the time of the explosion. He was not blown off the steps.

Cross-examined by Mr. CONWAY: There was a little gas, but not a great lot, escaping when they arrived. When the explosion occurred he had not finished plugging the hole, and had not reached the stage when they went round to see if there was any fire and open the windows. He would not use a match or a candle in a room where there was a leak, but he would test with them in the open air.

Mr. CONWAY: Is it true that you never carry matches?

Witness: I carry a few at the week-end.

Don't you normally every week day carry matches?—Yes.

Christopher Dunn, gas main layer in the employ of the Corporation, gave corroborative evidence, and added that the explosion seemed to come from behind. Simpson did not strike a match.

Evidence was given by Mr. *W. Doig Gibb*, Mr. *Charles Wood*, and Mr. *Charles Roper*. The expert evidence was expressive of the view that the explosion did not take place at the spot where the leakage occurred, but between the ceiling of the larder and the floor of the room above.

Mr. VACHELL, addressing the jury, said it was for them to decide whether the plaintiff had satisfied them that the fire occurred through the negligence of the defendants' workmen. He contended that the explosion did not originate where the defendants' employees were working.

His LORDSHIP, in his summing up, said there was no absolutely direct evidence that one of the workmen did light a match.

The jury returned a verdict for the plaintiff; and judgment was given accordingly—damages and all subsequent costs to be dealt with by an Official Referee.

HELPS v. OLDHAM CORPORATION.

HIGH COURT OF JUSTICE.—CHANCERY DIVISION.

Tuesday, Dec. 15.

The case was resumed to-day of the action relating to inventions for the use and production of gas. Plaintiff was Mr. George Helps, Gas Engineer and Inventor, who is General Manager to the Nuneaton Gas Company. Defendants were the Oldham Corporation. Plaintiff asked for an account of royalties which he alleged to be due for the use of an invention under a license dated June 4, 1919, damages for alleged breach of a contract dated April 29, 1918, relating to the use of certain ideas and information which the plaintiff communicated to the Corporation, and also for an injunction to restrain the Corporation from using these ideas anywhere but at their Higginshaw Works. The Corporation counterclaimed for damages on the ground that under the agreement of June 4, 1919, the plaintiff guaranteed that certain producer gas plant should be capable of a named output, which in fact it was incapable of producing. A report of the earlier proceedings was published in last week's "JOURNAL," p. 739.

Plaintiff agreed, in answer to further cross-examination by Sir Arthur Colefax, that the specification of the "Pleno" gas plant erected at Higginshaw stipulated for a capacity of 330 million B.Th.U. per 24 hours, and producing "20 million B.Th.U. per ton from good quality coal."

COUNSEL: There is no doubt that the plant was intended to be used with coal, for the purpose of complete gasification?

Mr. *Helps:* Yes, that is right.

On what occasion has Higginshaw run with coal, and obtained 20 million B.Th.U. per ton?—On the occasion to which Mr. Duxbury referred when he gave the figures.

COUNSEL: Those figures related to coke.

Sir Arthur Colefax read a letter to the Corporation in which plaintiff said: "I was rather astonished to see a report in the 'Gas World,' particularly as the plant has not been taken over by you. I fear this will cause a lot of trouble and a great deal of prejudice."

COUNSEL: The plant had not been taken over, because the Corporation had been unable to run with coal?

Witness: I refer to the plant being formally taken over.

You knew the Oldham authorities were complaining that the plant could not be made to run with coal?—I was not aware of that.

On Dec. 1, 1921, plaintiff's Company wrote: "We are quite prepared, however . . . to assist in working the plant, with a view to your using it for coal, and obtaining results which we know should be obtained; and this will be done in the nature of an act of grace."

COUNSEL: Surely at that time you knew it had not been worked successfully with coal.

Witness agreed that, in a paper read at Manchester, and reproduced in the "GAS JOURNAL" for Jan. 11, 1922, he said: The Oldham apparatus is a form of simple apparatus for producing a glorified, or rich, coal producer gas.

COUNSEL: In the same paper you also wrote: "We know that with this plant (at Higginshaw) we can make 20 million B.Th.U. of a quality of gas approximating to 200 B.Th.U. . . ." I suggest that you were making a purely theoretical deduction, and that no such result had ever been obtained from the plant at Oldham?

Witness: That is correct.

COUNSEL: Up to January, 1922, it had not been successfully run with coal?

Witness: It had been successful with the coal we use at Nuneaton.

COUNSEL: I suggest that we tried ten different coals sent by you, or on your behalf?

Witness: That is not correct.

COUNSEL read a letter dated May, 1921, in which it was stated that, though coke results at Higginshaw were not unsatisfactory, yet the plant could not be regarded as satisfactory until coal could be used.

Witness: You have not asked me why that complaint was made.

His LORDSHIP: You said you were not aware of any complaints that they could not obtain your results from coal.

Witness: I was wrong. I meant up to the time when I asked for royalties.

COUNSEL: So far as the Oldham officials are concerned, you have no hesitation in accepting my statement that they did their best to make the plant answer the guarantee?

Witness: They did.

COUNSEL: I put it to you that caking was not the trouble at Higginshaw?

Witness: Unquestionably it was.

COUNSEL: I will tell you what the trouble was, is, and will be. You cannot get the temperature sufficiently high to carbonize the

coal, and the tar produced is an insuperable difficulty.—It is not insuperable.

COUNSEL: Do you run the Nuneaton plant with coal?

Witness: Yes. At Nuneaton we had a plant similar to the one at Oldham, and we have figures, day in day out, and week in week out, showing what a good coal produces per ton.

His LORDSHIP: Was the plant the same?

Witness: Exactly.

COUNSEL: For this "Pleno" plant at Higginshaw, which has a maximum capacity of 125,000 c.ft. per hour, and where there is an exhauster capacity of 240,000 c.ft. per hour, what additional exhaust do you think necessary to make it work satisfactorily?

Witness: I cannot answer on these premises.

Wednesday, Dec. 16.

Dr. *W. B. Davidson*, M.A., F.I.C., gave expert evidence on behalf of plaintiff. Low-grade gas he defined as a coal gas degraded by means of water gas, producer gas, or even waste gas or air. The great problem of the day was to get thermal efficiency. It had surprised him to find that gas diluted with nitrogen was as useful to the consumer as a high-grade gas.

COUNSEL: Are you acquainted with the state of knowledge in the gas industry about the year 1916 and with their expectations and beliefs relating to low-grade gas?

Witness: Yes.

Was it the general view of the gas industry at that time that low-grade gas was at least as useful to the consumer as high-grade gas?—Certainly not.

Up to 1916, did you think that the presence of inerts up to 30 p.ct. was of little consequence?—I did not.

Witness gave the results of tests made with low and high grade gases. He found, he said, that low-grade gas, even 180 B.Th.U., could be successfully used not only for incandescent lighting, but for gas fires and all kinds of furnaces—except, perhaps, where a temperature equal to the fusion-point of brick was required.

COUNSEL: What is your view of the comparison you made between low-grade and high-grade gas?

Witness: As a result of my test, I am of opinion that, using coneless flames, there is a great superiority with low-grade gas in thermal efficiency, and that the disabilities formerly attributed to the presence of large quantities of inerts are now removed by the use of the coneless flame. Not only does the flame suffer no reduction in temperature, as formerly calculated or even measured without knowledge of the use of the coneless flame, but there is a gain. Further, low-grade gas has this wonderful effect—it ensures rapidity of combustion. On a given burner head, you can consume at least twice as many therms of a low-grade gas as you can of a high-grade gas.

COUNSEL: Is that an important point?

Witness: It is a very important point in fires, lighting, and furnace work.

Would you have expected comparative results of that order if you had been asked in May, 1918?—Certainly not. I should have given the contrary view.

Witness said there was no reason why the Higginshaw plant should not produce 20 million B.Th.U. per ton of coal, provided that a suitable coal were used. He thought Mr. Helps was mainly responsible for the selection of lower-grade gases as their standard of supply by many gas undertakings after the enactment of the Gas Regulation Act.

COUNSEL: You do not think it had anything to do with the practice gas companies had established?

Witness: No. I think they would not have dared to reduce the quality below 450, or thereabouts, if somebody else had not demonstrated that it was a successful proposition.

COUNSEL: Has it anything to do with the coming into use of vertical retorts?

Witness: Yes.

COUNSEL: According to your book, there were 109 gas committees or boards of directors who up to the end of 1922 were willing to reduce to 450 B.Th.U.?

Witness: Yes.

You state, on p. 182 of your book: The war, however, taught us several useful lessons, among which we may mention (1) a low-grade gas (say) of 450 B.T.U. gross, of a constant quality, and especially if low in inerts, is better than a rich gas of varying quality.

Witness: You note that "if low in inerts."

COUNSEL: You would like to leave out that passage now?

Witness: I would. In my opinion then, you dared not degrade coal gas with cheaper gas—*i.e.*, producer gas—because it would not be low in inerts.

Do you now want to insert a new term into your definition of low-grade gas, and say it must contain a large quantity of inerts?—No. I say it has to be a town gas.

But town gas is only gas made for distribution in towns?—Yes, but you dare not supply it in the towns unless it is satisfactory.

Take the 109 undertakings who selected 450 B.Th.U. Is that a low-grade gas?—I call 450 B.Th.U. and under a distinctly low-grade gas.

COUNSEL: I put it to you that there was a general movement for the reduction of calorific value from 1910 onwards?

Witness: A limited movement.

COUNSEL: It was the existence of the statutory obligation with regard to candle power that limited the downward movement?

Witness: No. There was a downward movement, but it was recognized that we could not go down very low, because the consumer would suffer.

Witness agreed that, as far as heat units were involved, 7 c.ft. of 500 B.Th.U. gas was equal to 10 c.ft. of 350 gas.

COUNSEL: That involves additional expense in distribution?

Witness: Not necessarily.

COUNSEL: How do you arrive at that?

Witness: Suppose you have mains of a given size and holders of a given capacity capable of exercising pressure up to (say) 10 in., it will depend on the pressure thrown by these holders, and what margin you have, whether or not you can supply greater volume.

Is it not a fact that the distribution system of a gas company is laid out to a certain capacity?—Yes.

As the sales increase, so you get nearer and nearer to the saturation point of your mains?—Yes.

Suppose an undertaking has reached saturation point, and is sending out 500 gas. If it begins to distribute 350 gas, does not this mean that the pressure has to be increased or the mains have to be enlarged?—It is a simple and a very cheap matter to increase the pressure.

Witness said he was certain that all burners used on gas-fires today did not give a coneless flame. He was not aware that the mixture of air with gas caused oxidation or rust in the mains. If it did, it could be easily overcome.

COUNSEL: I suggest to you that a good deal of the advantage which is derived from the use of low-grade gas comes from the use of a particular burner?

Witness: Yes.

Thursday, Dec. 17.

Dr. *W. B. Davidson*, further cross-examined, said that he had not previously seen Specification No. 16,881 of 1905, which was referred to in the plaintiff's burner patent No. 146,554. At first sight it seemed that the orifice shown in fig. 4 of the specification, if adjusted by screwing, would give a similar opening to that in plaintiff's burner.

Mr. TREVOR WATSON (for the plaintiff): There may be a question whether defendants are entitled to raise any such point on the pleadings.

Sir ARTHUR COLEFAX: I do not think there will be.

Witness agreed that in the Higginshaw "Pleno" plant the only methods provided for giving the heat necessary to carbonize the coal were conducting producer gas outside the retort, and drawing the rest of it through the coal.

COUNSEL: I put it to you that, running the plant in the way it is designed to be worked, it is impossible to produce sufficient heat from the producer gas to carbonize the coal so as to form coal gas and at the same time provide coke sufficient to furnish the necessary material for again making the producer gas.

Witness: I do not agree with that at all. I have had a great deal of experience in low-temperature carbonization, and I have found that, by means of internal heating by gas at a temperature of even 600° C., you get low-temperature carbonization. You do not require a high temperature to distil this coal.

COUNSEL: Have you tried this plant?

Witness: No.

COUNSEL: Have you heard the suggestion that attempts have been made in every way to produce the necessary heat, and that these attempts have failed?

Witness: I cannot understand the failure.

COUNSEL: Is the reason why you cannot understand the failure because of your experience with low-temperature carbonization?

Witness: No, the reason is that I have convinced myself that the plant at Nuneaton, which they told me was a replica—with the exception of the superheater, which is non-essential—worked with coal and gave no trouble. I saw this and a similar plant running; and both gave specially good gas.

COUNSEL: Will you take it from me that the plant was sold to carbonize 2 tons in each unit per day?

Witness: Yes, that is 1¾ cwt. per hour.

COUNSEL: Do you say that with this plant you can get sufficient heat to carbonize coal at that rate?

Witness: On my personal experience of working, no; on my observations and inquiries, yes.

COUNSEL: I put it to you that you cannot get a sufficient volume of producer gas through the coal in the retort to carbonize it?

Witness: I certainly do not believe that.

And the reason is that the interstices between the coal in the retort will not allow the passage of gas?—The gas will pass if there is sufficient suction.

The evidence will show that all kinds of suction have been tried.—You want to have sufficient power of suction. It is not simply capacity.

COUNSEL: I suggest that by external heat you do not get enough heating.

Witness: I do not agree.

And by internal heat you do not get enough volume?—I do not agree.

COUNSEL: I put it to you that, in order to keep the generator going, it is necessary to draw gas round the outside of the retort, and this pulls tar round the passage and clogs the superheater?

Witness: This again is due to the fact that you cannot, through lack of pull in your exhauster, get sufficient producer gas through the retort.

Witness, re-examined, said that by 1920 many people were beginning to see that low-grade gas was a good proposition. Until 1918 the general opinion of the industry was that low-grade gas was not suitable, and that one B.Th.U. was not as good as another. In fact, Mr. Helps had been pilloried by the industry on account of his proposals.

COUNSEL: You are now convinced that Mr. Helps' view is correct?

Witness: In general terms, yes. I do not agree with every figure put forward by Mr. Helps.

COUNSEL: Is that position generally accepted by the gas industry?

Witness: It is not.

Witness stated that, from the point of view of the modern gas fire, his experiments showed that the 280 gas was twice as good in radiation as the higher-grade gas. If any customer saw the two fires, he

would have no doubt as to which was preferable. There were many gas undertakings which supplied 400 gas without any alteration in the mains. At Nuneaton they had actually got down to 280 B.Th.U.

Mr. *W. A. Mackintosh Valon*, M.Inst.Mech.E., formerly Chief Engineer to a number of gas undertakings, including the gas and electricity undertaking of the Corporation of Stafford, said that Mr. Helps' proposals, when first made, were treated almost as a joke. He himself so regarded them.

Counsel: Do you still regard them as a joke?

Witness: I do not.

Counsel: At the time you read Specification No. 111,495 in the Technical Press, did it strike you as containing anything novel?

Witness: Certainly.

Witness stated that in 1917 he got into communication with Mr. Helps, who explained and demonstrated that one B.Th.U. was as good as another, and that inerts could be much higher than he previously thought. Prior to seeing Mr. Helps, he thought the low-grade gas would require larger mains; and even after the first interview he thought Nuneaton must have started with large mains. Subsequently he found this was not the case.

Counsel: What was your conclusion?

Witness: That we were all supplying gas of too high a grade, and that it would be to the advantage of the nation that the grade of gas were reduced.

Witness stated that when he left Stafford, in 1921, they were still distributing 450 gas. Cross-examined, he said that a preliminary agreement was made between Mr. Helps and the Corporation; but the Corporation did not sign the second agreement to pay royalties.

Counsel: Are you suggesting that the dropping of the calorific value of the Stafford gas to 450 in 1918 was an adoption of Mr. Helps' process?

Witness: No.

Counsel: Mr. Helps said that you could make 350 B.Th.U. gas about 30 p.ct. cheaper than 500 gas?

Witness: Yes, and I was satisfied that it was no exaggeration.

He was referring only to the manufacture of gas?—Yes.

That is only one part of its total cost?—Yes.

The Stafford Corporation have preferred to continue to manufacture 500 gas, which costs so much more?—We preferred to wait to see what Oldham did in the end.

Mr. *John T. Sheard*, Chief Chemist to the Sheffield Gas Company, said that when he first heard of Mr. Helps' system he thought it very heterodox, and not reasonable technically; but Mr. Helps convinced him that what the consumer was concerned with was the mixture of air and gas as it emerged from the burner. Tests which he made showed that low-grade gas gave better results than high-grade gas. The Sheffield Company entered into a preliminary agreement with Mr. Helps. He did not know whether they had made an agreement for royalties. Sheffield had been lowering the quality of the gas they supplied for the last thirty years.

Counsel: What is the calorific value of the gas which Sheffield are manufacturing and distributing?

Witness: 500 B.Th.U.

Major-General Sir *Frederick Poole*, Director of Gas Distribution, Ltd., said that before he joined the Board he went to Oldham to investigate the system and its working. The Oldham people were eminently satisfied and enthusiastic.

Counsel: Did that continue?

Witness: Yes, until we asked them for money.

Mr. *Samuel Hall*, Manager of the Builth Gas and Coke Company, said that he supervised the "Pleno" plant at Oldham, on behalf of the plaintiff, from September, 1920, until Christmas. It worked satisfactorily. While he was away ill, in November, an alteration was made, of which he did not approve. A greater pull had been put on the coal gas offtake and less on the producer gas offtake. The result was to upset the seals in the hydraulic main; and tarry matter went forward.

Counsel: What effect had that on the working of the plant?

Witness: You could not get the gas through.

Witness, cross-examined, did not agree that he had himself been altering the offtakes, in order to find a balance.

Mr. Abady: I put it to you that during the time you were at Oldham you were trying every device to make the plant work on coal, and that you had not succeeded in getting any practical permanent results.

Witness: I had succeeeded.

Friday, Dec. 18.

Mr. Trevor Watson applied for the postponement of the further hearing of the case owing to the illness of his leader, Mr. Whitehead.

His Lordship said he would consider that at the conclusion of the plaintiff's evidence.

Mr. *Helps* was recalled to identify a diagrammatic drawing of the plant at Nuneaton, which was said to be a replica of the Higginshaw plant except that the superheater had been removed.

Sir Arthur Colefax said the simplest thing would be an inspection of the Nuneaton plant by his experts.

Mr. *Helps*: I shall be delighted.

His Lordship suggested that an opportunity should also be given to plaintiff's experts to inspect the Higginshaw plant working with coal.

Sir Arthur Colefax: He shall choose his own coal, and we shall start up the eight units.

His Lordship: And let him "boss" the thing?

Sir Arthur Colefax: Certainly.

Mr. *Helps:* I suggest that the first visit should be to Nuneaton. We do not profess to be clever people there; and when they see what we can do, probably they will not want us at Oldham. (Laughter.)

His Lordship: You shall give the first hospitality.

The hearing was adjourned until next term.

MISCELLANEOUS NEWS.

POOLING AND CAPACITY OF COAL WAGONS.

Before the Royal Commission on the Coal Industry last week, evidence was tendered by Mr. F. W. Cooper (a member of the Committee of the Association of Private Owners of Railway Rolling Stock, and a partner in the firm of Messrs. Edwin A. Cornwall) and Mr. C. H. Taynton (the Secretary of the Association).

This was to the effect that the amount of private capital invested in privately owned railway wagons is enormous. Approximately 700,000 railway wagons, out of an estimated total of 1,400,000 wagons of all kinds running on the railway lines of this country, belong to private owners. Leaving out of consideration the large sums of money invested in the wagon building, hiring, repairing, and financing industries, the mere privately owned wagons themselves, at the most conservative estimate, must in the aggregate be worth between £55,000,000 and £60,000,000. This capital has been invested not only under the direct sanction of Act of Parliament, but, practically, by compulsion of the railway companies. Most of the 700,000 privately owned wagons are coal wagons, and the great bulk of coal conveyed over the railway lines in this country is conveyed in privately owned wagons. An ample and never-failing supply of mineral wagons is absolutely vital to the whole trade of this country. If there are delays in obtaining suitable wagons at the collieries, or any difficulty on the part of coal merchants and factors in obtaining a regular supply of wagons, practically every industry must suffer. Moreover, in periods of trade boom a reserve supply to carry the extra coal and other commodities involved is urgently required to be available instantly; it is only under the system of private ownership that such a reserve supply can be maintained. Railway companies are not prepared, and no public or quasi-public authority controlling the railways would be prepared, to provide wagons much in excess of the average demand. It would not pay them to do so, as it would entail large numbers of their wagons lying idle for sufficiently long periods to decrease materially the rate per cent. of the profits earned on the capital invested in wagon stock. With traders, however, it is different. Traders can and do provide a reserve, because it does pay them to do so. For, if the wagons are idle, they merely lose the interest on the capital outlay, but when they are loaded they earn not only the wagon rate, but also the profit, which would otherwise be missed, on what they carry. It is this profit which distinguishes the wagon owning traders' position from that of a railway company as wagon owner, and secures to the trade of the country a reserve of railway wagons for use when occasion arises.

The output of collieries is largely dependent on the regular supply of suitable wagons. Unless they do possess a continuous supply of wagons suited to their peculiar conditions, there will be days on which the colliery will stop working, and the men will be thrown out of employment. All private wagons have to be built in accordance with specifications and drawings issued from the Railway Clearing House—which frequently incorporate economies and improvements suggested by private owners in preliminary joint consultation—and they must be passed by a railway company's inspector before being admitted to traffic. There are many different types of coal wagons, which are designed and built for the particular trade in which they are intended to run, and for particular collieries. Many collieries can deal only with wagons of a certain height. Where coal is for shipment, the wagons require end doors. For ordinary purposes, side doors are necessary. For Welsh ports, too, a special type of wagon is required, and for other purposes again, hopper wagons alone are suitable. These facts make it impossible for wagons to be standardized, and empty wagons required at any given colliery to be taken without sorting. If, without such standardization, wagons were taken indiscriminately as required, many of them, on arrival at a colliery, would have to be rejected as being unsuitable either for loading there or for discharge at the siding or port to which they were to be dispatched when loaded; and any saving of time in sorting would be more than outbalanced by the chaos that would result at the collieries. The fallacy of the argument that pooling saves empty return journeys was dealt with, as was also the significant fact that, whenever trade is booming, there have always been constant complaints of shortage of wagons in that district, owing to there being no reserve trucks, and the railway company has invariably had to hire wagons from the private owners. It is also contended that one result of the pooling of railway wagons would be to increase their wear and tear, and consequently the cost of their maintenance, and increase the difficulty of keeping them in good running condition. Wagons requiring heavy repairs are usually dealt with at the repairers' shops; and if they were working indiscriminately over the country they would have to be sent much longer distances for this purpose, which would involve a considerable amount of dead haulage.

Private owners, with the incentive of their own financial interests, appoint competent members of their staffs to trace and follow-up their wagons, in order to ensure the best possible working; and if all such wagons were placed under the control of a central body, this duty could not be so efficiently performed, and the carrying done by the wagon would quickly be proportionately reduced. The result of pooling as between traders who do and traders who do not own wagons would be (contrary to public policy) to prejudice the most farsighted traders, who have made provision for the requirements of their trade by acquiring wagons, and to benefit their less enterprising competitors. No substantial saving of mileage could be achieved by any system of pooling wagons. The great bulk of heavy traffic flows within a distance of 15 to 35 miles, and cannot be shortened by any transport re-

arrangements without strangling trade. The average haul of all traffic, as given by the railway companies, is only 44 miles.

As regards increased capacity of coal wagons, advocated in some quarters, colliery proprietors, coal merchants, and others already regret the gradual substitution of the new standard 12-ton mineral wagon for the old 8-ton and 10-ton ones—the latter being far more suitable for many classes of trade. They are popular with the public (many of whom will take an 8-ton or a 10-ton truck load, but cannot take 12 tons), they are easy to handle and unload—an important factor in country districts where labour is scarce—they cost less to build, and the fuel arrives in much better condition. Except possibly for a very limited and special traffic wagons larger than the 12-tonner are most unsuitable. The 20-ton coal wagon not only remains unpopular, in spite of every effort to popularize it, but it is absolutely impracticable to run except to a limited extent. Its dimensions are such that the great majority of existing railway and colliery plants cannot deal with it at all, and its wheel base prevents it from negotiating the curves on numerous sections of the railway lines.

MINERS AND BYE-PRODUCT PROFITS.

Further evidence of interest to the gas industry was given to the Coal Commission on Dec. 17 by Lord Gainford, Chairman of the National Association of Coke and Bye-Product Plant Owners, who was accompanied by Mr. E. Bury, Fuel Consultant, who has done much in connection with low-temperature carbonization. As a matter of fact, little was said on this latter point; Mr. Bury expressing the opinion that low-temperature carbonization cannot be regarded as a commercial success until the return for the solid residue is sufficient, or nearly sufficient, to pay for the cost of the original coal. The main evidence related to what is being done at the bye-product plants in the iron and steel industry; and the interest in the evidence was the cross-examination of Lord Gainford by Mr. Herbert Smith, on behalf of the Miners' Federation. This cross-examination was on two points. First, that the coal owners are closely identified with the bye-product plants, and are supplying coal to them at prices below the pit-head prices; and secondly, that the miners should get some benefit from the profits being made by the bye-product companies, whether the plants are erected at the collieries or at the steel works, or, indeed, wherever they may be.

On the first point, concerning the allegation that coal is being supplied to the bye-product plants at prices below the pit-head prices, Lord Gainford said that was not the case, and expressed a willingness to allow all reasonable facilities for representatives of the miners to satisfy themselves on the point by investigation of the books of his own firm, Messrs. Pease & Partners.

Dealing with the second point—that the miners should share in the profits of the bye-product companies—Lord Gainford did not mince his words. He said he regarded the miners as having no concern of any sort in what the bye-product companies were doing. The latter bought the coal in the ordinary way, and after that the miners did not come into matters at all, inasmuch as they provided no labour and had no hand whatever in the subsequent operations. If this claim were to be allowed, then the miners could claim a share in the profits of every other industry using coal in large quantities, and could share in the profits of the gas industry, the electrical industry, the shipping industry, and so on.

TRADE NOTES.

General Machinery Catalogue.

Messrs. George Cohen, Sons, & Co., Ltd., of 600, Commercial Road, E. 14, have published a new general machinery catalogue, which shows the wide range of their stock. Copies will be sent to those interested, on application to the firm.

New Holder for Montrose.

The Montrose Gas Company, Ltd., have placed an order with the Barrowfield Iron Works for a 500,000 c.ft. spiral-guided gasholder with tank above ground. The work will be started immediately, and will, it is expected, be completed by the end of September next.

"T.I.C." Plant for Whitchurch.

The Whitchurch (Salop) Gas Company, on the recommendation of their Engineer and Secretary (Mr. J. P. Lawson), have placed an order with the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., for a combined road tar ("T.I.C." lead bath) bitumen mixing plant. The distillation plant has a capacity of 10 tons a day.

CONTRACTS OPEN.

Pipes and Specials.

The Wallasey Corporation are inviting tenders for the supply of cast iron pipes and specials. [See advert. on p. 807.]

Vertical Retort Ovens Brickwork.

The Arbroath Gas Corporation are inviting tenders for the supply and building-in of brickwork for two ovens of vertical retorts. [See advert. on page 807.]

EXTENSIONS.

Burton-on-Trent Carburetted Water Gas Plant.

In the paragraph on p. 742 of last week's issue referring to extensions at the Burton-on-Trent Gas-Works, it was stated that it had been decided to erect "a new carburetted water gas plant—the cost (£28,450) to come out of the revenue." This should have read: "The cost to come out of the reserve fund, which stands at £28,450." The proposed water gas plant has a capacity of 800,000 c.ft. per day; and the estimated total cost of the installation is £6000.

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

The market closed the week quietly steady. There is a good amount of inquiry for prompt and for the rest of the month, but very little coal offering. Most collieries appear to be fully sold and stemmed, so that full prices are obtainable for any prompt parcels that are available.

The current week will no doubt be quiet, with the approach of the Christmas holiday.

Northumberland steams have been firm and prices fully maintained. Durhams are in good demand for all positions, and Wear Specials quote 17s. 3d. to 17s. 6d. f.o.b., best qualities being 16s. 6d. Seconds quote 15s. 3d. to 15s. 6d., and these prices are firm for shipment into January, for which there has been considerable inquiry. Unscreened coking is asked for in considerable quantities, both for home consumption and for export.

The demand for coke remains strong, and makers are, if anything, oversold. Gas makes are fully 25s. f.o.b., and patent foundry 22s. 6d. to 23s. 6d. The outlook is good.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

The severe weather has caused a rush of orders for household coal, with the result that many collieries report that they are unable to make prompt delivery of additional orders before Christmas. The London market has been particularly active. This week large quantities of double-screened nuts have been purchased at enhanced prices in order to supply the requirements of the Metropolitan area. It is not often that this size of coal is in demand for domestic use.

The industrial situation remains firm, with indications that renewals of contracts for the better grades are being made at slightly increased figures. The commoner coals for steam raising are practically the same; but slacks of a coking nature are in request.

Some gas undertakings have bought extra quantities to put into stock, and have had no difficulty in buying at figures from 1s. to 1s. 6d. a ton in advance of their contract prices.

The export trade shows hards, washed doubles, and washed smalls firm, with furnace coke slightly weaker.

There appears to be a general shortage of wagons, probably due to some congestion on the railways, no doubt brought about by the sudden rush of house coal orders during the past few weeks, while the fog experienced some weeks ago upset calculations for a time.

The following are the Humber bunker and export prices (f.o.b. usual shipping ports), in many instances nominal: South Yorkshire—Hards, 19s. 6d. to 20s.; washed doubles, 20s. to 21s.; washed singles, 18s.; washed smalls, 16s.; rough slack, 10s. 6d.; smithy peas, 10s. 6d. West Yorkshire—Hartleys (f.o.b. Goole), 17s. to 18s.; unwashed doubles, 14s. 6d.; Derbyshire and Nottinghamshire, 20s.; hards, 20s.; washed trebles, 20s. to 21s.; washed doubles, 20s.; washed smalls, 13s. 6d. to 14s. 6d.; rough slack, 11s. Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, 18s. to 19s.; gas coke, 26s. to 27s.; furnace coke, 20s. to 21s. per ton.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

Acute difficulty has been experienced in some parts of the Midlands in satisfying the demand for house coal, which has quickened as usual with the approach of Christmas. Owing to the breakdown of transport facilities on the railways, deliveries have got seriously into arrear in the Birmingham area, and it has been a hopeless struggle to overtake them. But for the fact that the gas undertakings are well safeguarded with reserves, and the dullness of the industrial demand, the disorganization would be more widespread. Weather conditions have been less chargeable with responsibility for delays than was the case a week or two ago; but attempts to straighten out the disorder into which traffic has fallen appear to have had little effect. There is no actual shortage except of a local and temporary character. Collieries have, however, been frequently held up for lack of wagons, so that engagements could not be fulfilled. The stiffer tendency of prices has continued as regards many descriptions of house coal. Steams are unchanged.

Nothing has come of an endeavour to find a basis of agreement for blast-furnace coke in the new year. Under the arrangement between Midland pig-iron makers and the collieries the price has been stabilized during the past three months at 11s. 9d. for minimum grade at ovens. Since that arrangement was made, the price on the open market has increased substantially owing to the seasonal demand for domestic and other heating purposes. The ovenmen proposed to raise the basis for the new year by half-a-crown. A shilling was the utmost smelters would concede, and negotiations broke down.

South Barracas (Buenos Ayres) Gas and Coke Company, Ltd.—The report for 1924, to be submitted at the meeting on the 30th inst., states that, adding the debit balance brought forward, there is a total debit of £198,766. At Dec. 31 last, the amount owing to the Primitiva Gas Company of Buenos Ayres was £32,056, with every indication that the debt would further increase. It is evident, say the Directors, that if the present arrangement continues the position will become worse. The state of the Company's affairs is such that it is impossible to formulate any scheme which would justify raising sufficient money to pay off the above debt and find the large amount of working capital which would be required to get together an organization and erect new plant for the production of gas. Negotiations are in progress by means of which it is hoped to find some solution of this difficult situation.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *Dec.* 21.

The market for pitch continues to firm up, and it is reported that 55s. per ton and over has been paid. The price remains at about this level.

Creosote remains steady, and the price is unchanged at 7¼d. to 7½d. per gallon.

Other products are unchanged at the prices last recorded.

Tar Products in the Provinces.

Dec. 21.

Markets for tar products generally remained firm throughout the past week.

Pitch is still very firm, with buyers indicating 55s. and makers 57s. for January/March.

The creosote market remains firm, and prices are well maintained.

Water-white products are in good demand, and contracts are reported to have been made for solvent naphtha for the first half of next year at good prices. Crude carbolic acid remains quiet, but generally speaking the ideas of buyers are below the figure at which makers can afford to sell. Cresylic acid keeps steady, with a fair demand at improved prices.

Naphthalene and anthracene remain unchanged.

The average values for gas-works products during the week were: Gas-works coal tar, 37s. 9d. to 42s. 9d. Pitch, East Coast, 55s. to 56s. f.o.b. West Coast—Manchester, 49s. to 50s.; Liverpool, 50s. to 51s.; Clyde, 54s. to 55s. Benzole, 90 p.ct. North, 1s. 7½d. to 1s. 8½d.; crude, 65 p.ct., at 120° C., 1s. to 1s. 1d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 7½d. to 1s. 8½d. Toluole, naked, North, 1s. 6½d. to 1s. 7½d., nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8½d. Solvent naphtha, naked, North, 1s. 4½d. to 1s. 6d. Heavy naphtha, North, 1s. to 1s. 1d. Creosote, in bulk, North, liquid, 6½d. to 6⅝d.; salty, 6d. to 6½d.; Scotland, 5¾d. to 6d. Heavy oils, in bulk, North, 6½d. to 6⅝d. Carbolic acid, 1s. 4d. to 1s. 5d. prompt. Naphthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Manchester District Tar Prices.

The net price realized for the sale of tar in the Manchester district, according to the sliding-scale, for October was £2 6s. 8·71d.

Clitheroe Price Increase.—The price of gas is to be increased at Clitheroe by 4d. per 1000 c.ft. as from Christmas Day. This is on account of the higher cost of production.

Brighton and Hove Gas Company.

Under the chairmanship of Mr. A. M. Paddon, a special general meeting of the Brighton and Hove General Gas Company was held on Dec. 11. The Chairman moved a resolution approving of the Draft Special Order under section 10 of the Gas Regulation Act, being an application to the Board of Trade to confer further powers upon the Company. The draft contained in section 4 an extension of the limits of supply which would bring into the Company's area the parishes of Falmer, Ilford, Rodmell, Southease, Stanmer, and Telscombe. The price of gas in the new area was not to be more than 3d. per therm above the price for the time being charged in the "inner area," though the Company might charge a less price than that authorized. Provision was made for the conversion of the existing 10 p.ct. standard original ordinary stock into a 6 p.ct. standard consolidated stock, and for the conversion of the existing 7 p.ct. standard "A" ordinary stock into 5 p.ct. standard consolidated stock. After explaining other points relating to the conversion, he said that by section 18 there was an alteration in the sliding-scale of increments—3s. p.ct. per annum for each 0·2d. per therm on £116 13s. 4d. of the new 6 p.ct. standard stock, which was equivalent to 5s. p.ct. on £100 of the 10 p.ct. stock; and 3s. 6d. p.ct. for each £140 13s. of the new 5 p.ct. stock, which was the equivalent of 4s. 11·073d. p.ct. on £100 of the 7 p.ct. original stock. Mr. G. W. Carey (Deputy-Chairman) seconded the motion, which was agreed to without further discussion.

Mr. E. J. Sutcliffe (Deputy Gas Engineer to the Bradford Corporation) gave, on Dec. 15, a lecture on gas manufacture to the members of the Bradford Engineering Society. He described the processes of gas making, and mentioned that in Bradford there were nearly 84,000 gas consumers, requiring service by over 500 miles of mains, varying from 2 to 28 in. in diameter. Last year, he said, over 161,000 tons of coal were carbonized, and over 2000 million c.ft. of gas sold. He predicted the future generation of electricity by the use of large gas engines coupled direct to dynamos.

The question as to whether a kettle boiling-over on a gas ring extinguished the jets and left the gas escaping was raised at a Lambeth inquest on a man who was found dead from coal gas poisoning in a room in which was a ring with a kettle on top and the gas turned on but unlighted. A constable and the police surgeon both expressed the opinion that this was what had happened. Mr. Henry de Frece (of the Gas Light and Coke Company) agreed that if the gas pressure happened to be sluggish, water might extinguish the flames, though it would not do so with full pressure. He could not, however, definitely say that if water boiled over it would put out the gas. The Coroner adjourned the inquiry for a test to be made with the same appliances, and in deceased's room.

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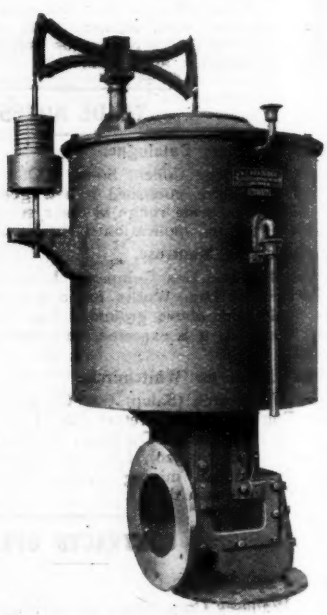

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STOCK MARKET REPORT.

MANY factors contributed to the slackness which prevailed on the Stock Exchange last week. The principal of these were the abnormal batch of new issues, the year-end monetary shortage, and the uncertainty of the French financial position. British Government stocks were firm; improvements being recorded in the 5 p.ct. War Loan and the 3½ p.ct. Conversion Loan. The chief interest of note in the Foreign Market was the recovery in French bonds, and both the fives and the four p.ct. were marked up ¾ and ⅝ respectively. Rubbers, however, again dominated the position; but a fall in the price of the raw commodity, which came down at one time to 3s. 10d. per lb. for spot lots, militated against any further appreciation in the share prices, and business was lighter than for some time past. To the surprise of many, most of the new issues were largely over-subscribed, particularly the German Textile Loan. On the other hand, the latest Artificial Silk issues were unsuccessful, and the underwriters were left with a large proportion of their commitments.

The Gas Stock Market was very sad. The steady improvement which had taken place during the past two months is not being maintained; and though prices are a point or two above those prevailing immediately prior to the upward movement, it does not appear that they are stable. The changes in the quotations during the week were unimportant. The Gas Light and Liverpool Companies were both marked down 1 point, and there were no increases.

The following transactions were recorded during the week:

On Monday, Brentford "A" 100, 5 p.ct. preference 97½, 6 p.ct. debenture 103, Commercial 3½ p.ct. 81¼, Continental Union 35, Croydon sliding-scale 98½, maximum dividend 84, European 6½, Gas Light and Coke 84½, 84⅝, 85, 85⅝, 86, 4 p.ct. preference 79, 80, Imperial Continental 136, Primitiva 11s. 3d., 11s. 4½d., 11s. 9d., South Metropolitan 93¾, 94⅞, South Suburban 5 p.ct. 100. Supplementary prices, Barnet "A" 149, South Suburban 7 p.ct. debenture 103, Southend-on-Sea 4 p.ct. debenture 70⅞, 71½.

On Tuesday, Bombay 18s. 6d., 18s. 9d., Brentford 5 p.ct. preference 97½, Brighton and Hove 10 p.ct. 171½, British 105¼, Commercial 4 p.ct. 81, 81½, 82, 3½ p.ct. 82, Gas Light and Coke 84¼, 84½, 84⅝, 85, 85¼, 85½, 4 p.ct. preference 78⅞, 79, Imperial Continental 135, 136, Primitiva 11s. 6d., 11s. 9d., South Metropolitan 94, 94⅞, 3 p.ct. debenture 58. Supplementary prices, Cape Town 5 p.ct. debentures 74½, Colonial 5 p.ct. debentures 71½.

On Wednesday, Brentford 6 p.ct. Richmond debenture 104½, Brighton and Hove 10 p.ct. 172⅝, Commercial 4 p.ct. 81⅞, European 6½, Gas Light and Coke 84½, 84⅝, 85½, 4 p.ct. preference 78½, 3 p.ct. debenture 60½, 60⅝, Imperial Continental 135, 136½, Primitiva 11s. 3d., 11s. 4½d., 11s. 6d., South Metropolitan 94⅞, 3 p.ct. debenture 59½, Tottenham "B" 90.

On Thursday, Bombay 19s. 4½d., Bournemouth 4 p.ct. debenture 78½, Commercial 4 p.ct. 83, European 6, Gas Light and Coke 84, 85, 3½ p.ct. maximum 60½, 3 p.ct. debenture 60 *ex* div., Imperial Continental 134, 135½, 136½, Montevideo 70, Oriental 102¼, Primitiva 11s. 3d., San Paulo 5 p.ct. debentures 44, South Metropolitan 94.

On Friday, Brentford "A" 98½, Gas Light and Coke 84, 84¼, 84½, 85, 85¼, 4 p.ct. preference 78⅛, Hongkong and China 20, Liverpool 7 p.ct. preference 102½, 103, Primitiva 11s. 1½d., South Metropolitan 93⅞, 94, 94¼, 94½, 95, 3 p.ct. debenture 59, Wandsworth "B" 110. Supplementary prices, Colonial Gas Association 20s. 9d.

In Lombard Street at the close of the week the discount market, following the announcement that tenders for the new Treasury Bills had been allotted in full at £4 16s. 10·86d. p.ct., became firmer. For renewal of loans the rate was 4 p.ct.; but fresh money was to be had slightly cheaper.

Interest in the Foreign Exchange Market was centred in the French franc. On Friday, opening at 133¼, the Paris cheque fell rapidly to 127⅛, and at one time on Saturday dropped to 125¼. The sudden recovery is attributed to the proposal submitted by the industrialists for alleviating the present financial crisis. Sterling on New York was steady, closing at 4.85½. Italian lire dropped to 120½, and Belgian francs were slightly dearer at 106.95.

Silver improved slightly at the end of the week, and was quoted at 31 1/16d. per oz. for cash. Gold remained at 84s. 11½d. per oz., but 1d. less is being paid for a shipment for India.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on Dec. 3. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3¼ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Dec. 18.	Rise + or Fall − on Week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Aug. 13	5	5	Aldershot 5 p.c. max. C.	75—78	..	..
322,992	,,	,,	4	4	Do. 4 p.c. Pref.	70—75	..	..
1,551,868	,,	Oct. 8	6½	6½	Alliance & Dublin Ord.	68—72	..	..
374,000	,,	July 9	4	4	Do. 4 p.c. Deb.	60—65	..	..
300,000	1	Oct. 22	1/7½	1/7½	Bombay, Ltd.	¼—1	..	18/6—19/4½
170,000	10	Aug. 13	8½	8½	Bournemouth 5 p.c.	12—13	..	..
425,050	10	,,	7	7	Do. B 7 p.c.	12—13½	..	..
150,000	10	,,	6	6	Do. Pref. 6 p.c.	11—12	..	..
50,000	Stk.	June 25	3	3	Do. 5 p.c. Deb.	56—59	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	77—80	..	78½
992,045	,,	July 9	6 1/10	6 1/10	Brentford A Con.	98—103	..	98½—100
990,500	,,	,,	6⅝	6⅝	Do. B New	98—103	..	..
76,000	,,	,,	5	5	Do. 5 p.c. Pref.	93—98	..	97½
306,690	,,	Dec. 17	4	4	Do. 4 p.c. Deb.	75—80*	−1	..
181,337	,,	,,	6	6	Do. 6 p.c. Rich. Red. Deb.	100—103*	..	103—104½
214,740	,,	Aug. 27	12½	12	Brighton & Hove Orig.	170—175	..	171½—172½
244,200	,,	,,	9½	9	Do. A Ord.	137—142	..	..
1,287,500	,,	July 23	5	5	Bristol 5 p.c. max.	89—91*a*	..	..
855,000	,,	Oct. 8	7	8	British Ord.	105—110	..	105½
100,000	,,	June 25	7	7	Do. 7 p.c. Pref.	120—125	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	71—76	..	..
100,000	10	Dec. 17	8	6	Cape Town, Ltd.	6½—7½*	−½	..
100,000	10	Nov. 5	4½	4½	Do. 4½ p.c. Pref.	6½—7½	..	..
150,000	Stk.	June 25	4½	4½	Do. 4½ p.c. Deb.	70—75	..	..
626,860	,,	July 23	6	6	Cardiff Con. Ord.	98—101	..	..
237,860	,,	June 25	7½	7½	Do. 7½ p.c. Red. Deb.	101—104	..	..
157,150	,,	Aug. 13	6½	5	Chester 5 p.c. Ord.	90—95*b*	..	..
1,513,280	,,	July 23	5/14/8	5⅜	Commercial 4 p.c. Cap.	81—86	..	81—83
560,000	,,	,,	5⅜	5/3/4	Do. 3½ p.c. Cap.	81—86	..	81½—82
475,000	,,	Dec. 17	3	3	Do. 3 p.c. Deb.	55—58*	−1	..
800,000	,,	Oct. 8	—	4	Continental Union, Ltd.	35—40	..	35
200,000	,,	,,	7	7	Do. 7 p.c. Pref.	87—90	..	..
660,000	,,	Aug. 13	6½	6½	Croydon sliding scale	97—101	..	98½
284,975	,,	,,	5	5	Do. max. div.	81—84	..	84
498,270	,,	Aug. 13	9	6	Derby Con.	107—109*c*	..	..
55,000	,,	Dec. 17	4	4	Do. Deb.	74—76*	..	..
1,002,180	10	July 23	4	6	European, Ltd.	6—7	..	6—6½
16,460,070	Stk.	Aug. 13	5½	5½	Gas Light & Coke 4 p.c. Ord.	84—86	−1	84—86
8,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	60—63	..	60½
4,068,235	,,	,,	4	4	Do. 4 p.c. Con. Pref.	77—80	..	78½—80
4,761,930	,,	Dec. 17	3	3	Do. 3 p.c. Con. Deb.	58—61*	−2	60—60½
130,000	,,	—	10	10	Do. 10 p.c. Bonds	..	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Sept. 10	6½	6½	Hastings & St. L. 5 p.c. Conv.	90—95	..	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	72—76	..	..
70,000	10	Sept. 24	10	10	Hongkong & China, Ltd.	19½—20½	..	20
86,600	Stk.	Aug. 13	10	10	Hornsey 7 p.c.	132—137	..	..
1,976,000	,,	Nov. 19	59	10	Imperial Continental Cap.	133—138	−2	134 136½
226,170	,,	Aug. 13	3½	3½	Do. 3½ p.c. Red. Deb.	70—73	..	..
235,242	,,	Aug. 13	6½	6½	Lea Bridge 5 p.c. Ord.	97—102	..	..
2,127,340	,,	Aug. 13	5½	5½	Liverpool 5 p.c. Ord.	82—83*b*	−1	..
600,000	,,	Sept. 24	7	7	Do. 7 p.c. Red. Pref.	101½—103½*b*	..	102½—103
165,736	,,	Aug. 27	8	9	Maidstone 5 p.c. Cap.	118—128	..	..
63,480	,,	Dec. 17	3	3	Do. 3 p.c. Deb.	54—59*	−1	..
75,000	5	Dec. 3	7	6	Malta & Mediterranean	4½—5	..	..
341,920	Stk.	Nov. 19	4	4	Montevideo, Ltd.	68—72	..	70
1,061,315	,,	Aug. 13	5	5	Newcastle & Gateshead Con.	69—71*d*	..	..
300,939	,,	,,	4	4	Do. 4 p.c. Pref.	75½—76½*d*	..	..
329,705	,,	Dec. 17	3½	3½	Do. 3½ p.c. Deb.	66½—67½*d**	−1½	..
15,000	,,	Aug. 27	12	11½	North Middlesex 10 p.c.	160—170	..	..
75,940	,,	,,	8⅞	8 6/10	Do. 7 p.c.	115—120	..	..
300,000	Stk.	Dec. 3	7	9	Oriental, Ltd.	98—103	..	102½
188,120	,,	June 25	7½	7½	Plym'th & Ston'house 5 p.c.	112—117	..	..
60,000	50	Aug. 27	14	14	Portsea Island B	93—96	..	..
100,000	50	,,	13	13	Do. C	90—93	..	..
2,289,909	1	—	—	—	Primitiva Ord.	11/0—12/0	−/3	11/1½—11/9
302,600	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb.	82—84	..	..
600,000	Stk.	July 23	4	4	Do. 4 p.c. Red. Deb. 1911	64—66	..	..
193,744	,,	Dec. 17	4	4	Do. B. Aires 4 p.c. Rd. Db.	64—66*	−1	..
264,496	,,	,,	4	4	Do. R'r P'ts 4 p.c. Rd. Db.	64—66*	−1	..
150,000	10	Sept. 24	6	6	San Paulo 6 p.c. Pref.	7½—8	..	..
125,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	42—45	..	44
870,000	Stk.	Aug. 27	5½	5½	Sheffield A	99—101*e*	..	..
419,968	,,	,,	5½	5½	Do. B	99—100*e*	..	..
1,047,000	,,	,,	5½	5½	Do. C	99—100*e*	..	..
90,000	10	June 11	6	4	South African	5—7	..	..
4,609,895	Stk.	Aug. 13	6½	5	South Met. Ord.	93½—95½	..	93½—95
1,895,445	,,	July 9	3	3	Do. 3 p.c. Deb.	57—60	..	58—59½
734,000	,,	Sept. 10	6½	6½	Do. 6½ p.c. Red. Deb.	103—105	..	..
91,500	,,	Aug. 13	8½	8½	South Shields Con.	129—131*d*	..	..
1,187,795	,,	July 23	6½	6½	South Suburban Ord. 5 p.c.	99—103	..	100
368,837	,,	Dec. 17	5	5	Do. 5 p.c. Deb.	93—96*	−2	..
647,740	,,	Oct. 22	5	5	South'mpt'n Ord. 5 p.c. max.	78—81	..	..
121,875	,,	June 25	4	4	Do. 4 p.c. Deb.	70—75	..	..
250,000	,,	Aug. 27	7	7	Swansea 7 p.c. Red. Pref.	100—102	..	..
200,000	,,	Dec. 17	6½	6½	Do. 6½ p.c. Red. Deb.	99—101*	−2	..
180,000	,,	July 23	8	7½	Tottenham District A 5 p.c.	110—115	..	..
882,275	,,	,,	6½	5½	Do. B 3½ p.c.	88—93	..	90
150,000	,,	July 9	—	28/4	Do. 5½ p.c. Pref.	103—105	..	..
181,255	,,	Dec. 17	4	4	Do. 4 p.c. Deb.	74—77*	−2	..
258,251	,,	Aug. 27	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, & Wycombe 5 p.c.	69—71*d*	..	..
197,294	,,	Aug. 27	6½	6½	Do. 5 p.c. pref.	93—98	..	..
88,350	,,	,,	5	5	Do. 5 p.c. Maidenh'd	93—98	..	..
91,800	,,	,,	6½	6½	Wandsworth, Wimbledon, and Epsom—	88—93	..	..
50,000	,,	July 9	9½	8½	Wandsworth A 5 p.c.	128—133	..	..
455,636	,,	,,	7½	7	Do. B 3½ p.c.	109—114	..	110
392,933	,,	,,	6/9/6	5/19/0	Do. C and New	92—97	..	..
350,000	,,	,,	7⅞	6½	Wimbledon 5 p.c.	103—108	..	..
98,000	,,	,,	7½	7½	Epsom 5 p.c.	113—118	..	..
88,426	,,	June 25	3	3	5 p.c. Deb.	56—59	..	..

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QUALIFIED Gas Engineer, Young, Capable, and Healthy, seeks RESPONSIBLE POST on Gas-Works abroad, British Colony preferred. Address No. 7622, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C. 4.

APPOINTMENTS, &c., VACANT.

REQUIRED by a Provincial Company, a well-trained DISTRIBUTION ENGINEER, who would be required to modernize the Existing Distributing System and eventually Take Control of same. Commencing Salary, £450 per Annum.
Applications, with *copies* of Testimonials, to be addressed to No. 7621, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C. 4, not later than Jan. 4, 1926.

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BALE & CHURCH, LTD.,
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Tins for Sale to Consumers.
In Bulk for Works Use.
(*See "The Gas Salesman," p. 260*).

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COUNTY BOROUGH OF DEWSBURY.
(GAS UNDERTAKING.)

TECHNICAL ASSISTANT.

APPLICATIONS are invited for the Position of TECHNICAL ASSISTANT for the above Gas Undertaking, at a commencing Salary of £250 per Annum.

Applicants must have experience in Chemical testing, General and Routine work of Manufacture and Distribution, keeping Record Books and Drawings of Works and District, and Experience with Horizontal Retorts and Stoking Machinery, Purification, and Tar Dehydration.

GENERAL WORKS FOREMAN.

Applications are also invited for the Position of GENERAL WORKS FOREMAN for such Undertaking at a wage of £4 5s. per Week, with House, Coal, and Lighting free. Experience with Horizontal Retorts and Electrical Stoking Machinery, Purification, Sulphate Plant and Tar Plant necessary.

Applications, stating Age and past Experience, together with *copies* of not more than Three Testimonials, and endorsed "Technical Assistant" or "General Works Foreman" respectively, should be Delivered to the undersigned not later than Monday, the 3rd of January, 1926.

HOLLAND BOOTH,
Town Clerk.

Dec. 18, 1925.

WANTED by 700 Million Works near London, First-Class DISTRIBUTION FOREMAN to work under Superintendent.

Applicants must have a thorough Practical Knowledge of Main and Service Work and Internal Fitting, including all Types of Modern Gas Apparatus, and be capable of Controlling Workmen.

Apply, with full Particulars, stating Age and Salary required, and *copies* of Two Testimonials, to No. 7620, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C. 4.

WANTED for April 1, 1926, a Working MANAGER for country gas-works now making seven million cubic feet.

Apply, stating Wages and Experience, to the SECRETARY, RAMSEY GAS-WORKS, HUNTINGDONSHIRE.

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GASHOLDER & Steel Tank. 10,000 c.ft.
Purifiers.—Dry lutes: Two 10 ft. by 8 ft. Water lutes: Four 8 ft. sq., Two 8 ft. sq., One 10 ft. by 8½ ft.
Livesey Washers.—250,000 and 200,000 c.ft.
Scrubbers.—One Brush Washer-Scrubber, 6 in.
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Condensers.—Water cooled, 500,000 c.ft. per day. Two New Sets Blakeleys Baffle-Plate Condensers.
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